GAS

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

MAY 2 1 1945

MCO REGULATORS

T ENGINEE
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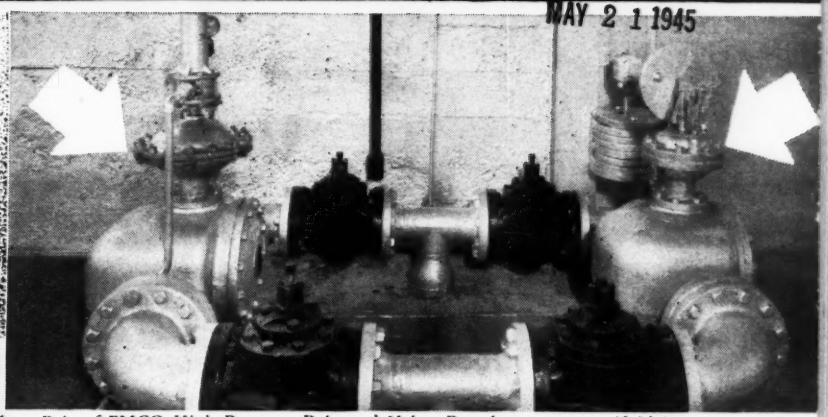
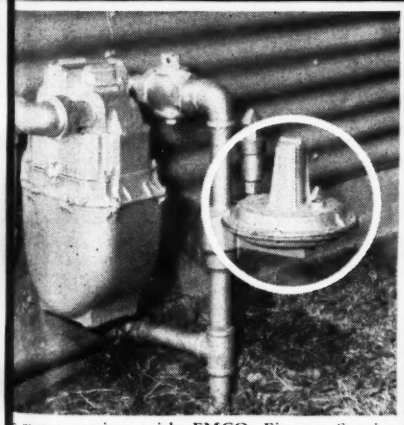
STOP

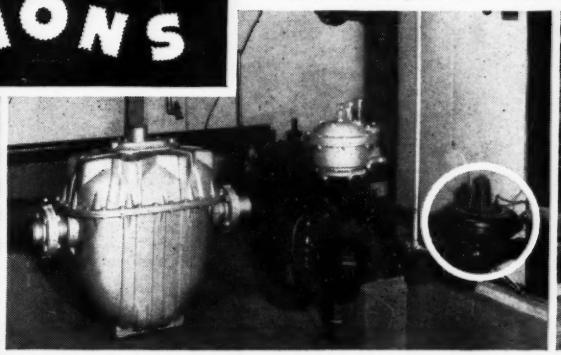
PRESSURE
LUCTUATIONS



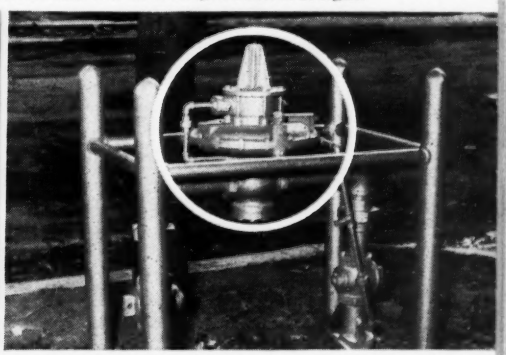
Pair of EMCO High Pressure Balanced Valve Regulators on manifold in town border station. EMCO pilot loaded control at left; lever and weight control at right.



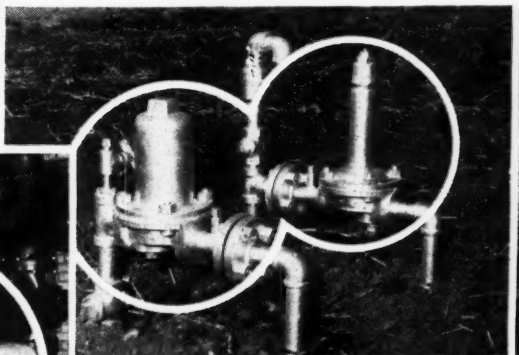
meter setting with EMCO Ejector Service controlling house utilization pressure.



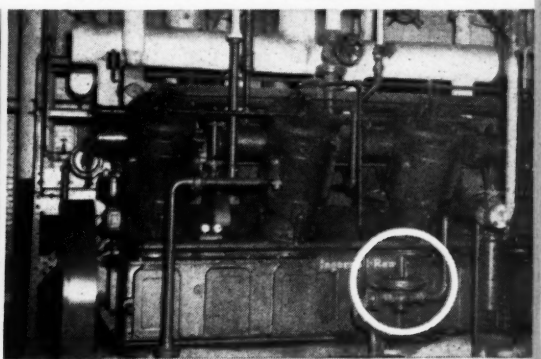
EMCO Appliance Regulator holding constant burner pressure on industrial water heater.



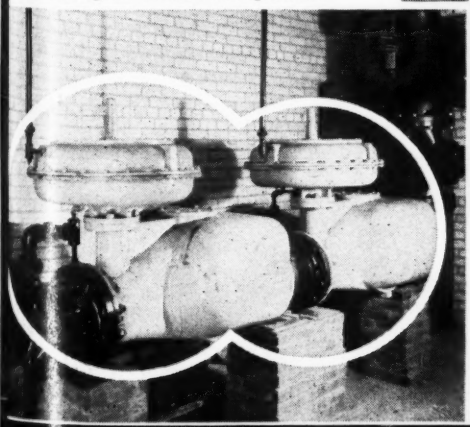
This EMCO "1001" Regulator is used for district pressure control in a municipal distribution system.



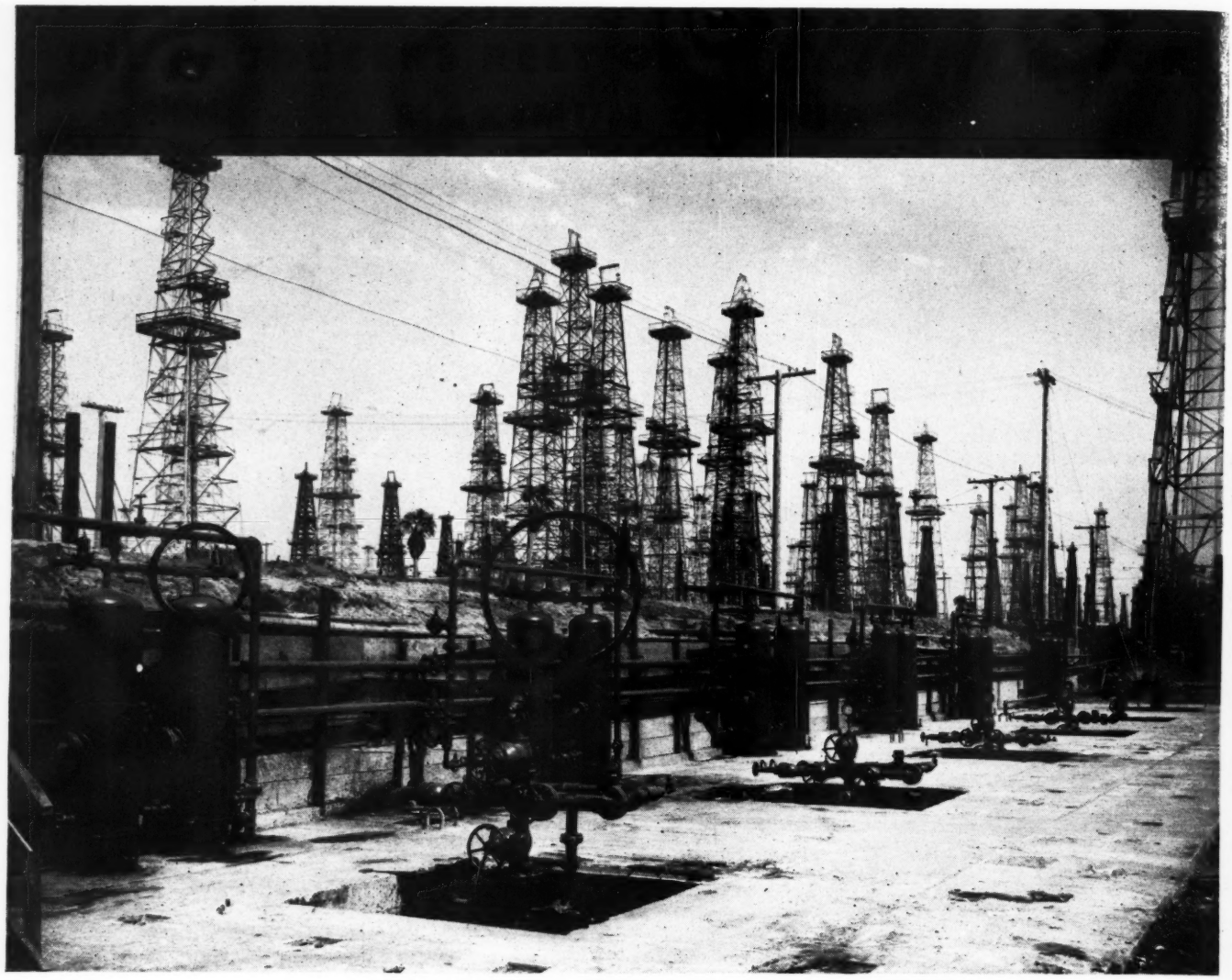
These EMCO Field Regulators cut high transmission line pressures to a constant intermediate distribution range.

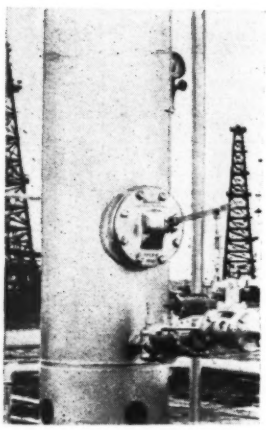


This engine burns natural gas at a uniform pressure supplied through a Crawford Regulator.



Manufactured gas served to large housing project is controlled by two 10" EMCO Low Pressure Balanced Valve Regulators.





Wherever gas is used in the oil fields, you will find Reliance Regulators on the job, contributing their part to the ever growing output of petroleum.

Reliance Regulators assure positive pressure regulation and control at the boilers which supply the power and at every step from the tapping of the crude to the refining of the fractions. For 34 years Reliance has served the oil industry as the source of supply for dependable regulators, with an established reputation for trouble-free and economical service.

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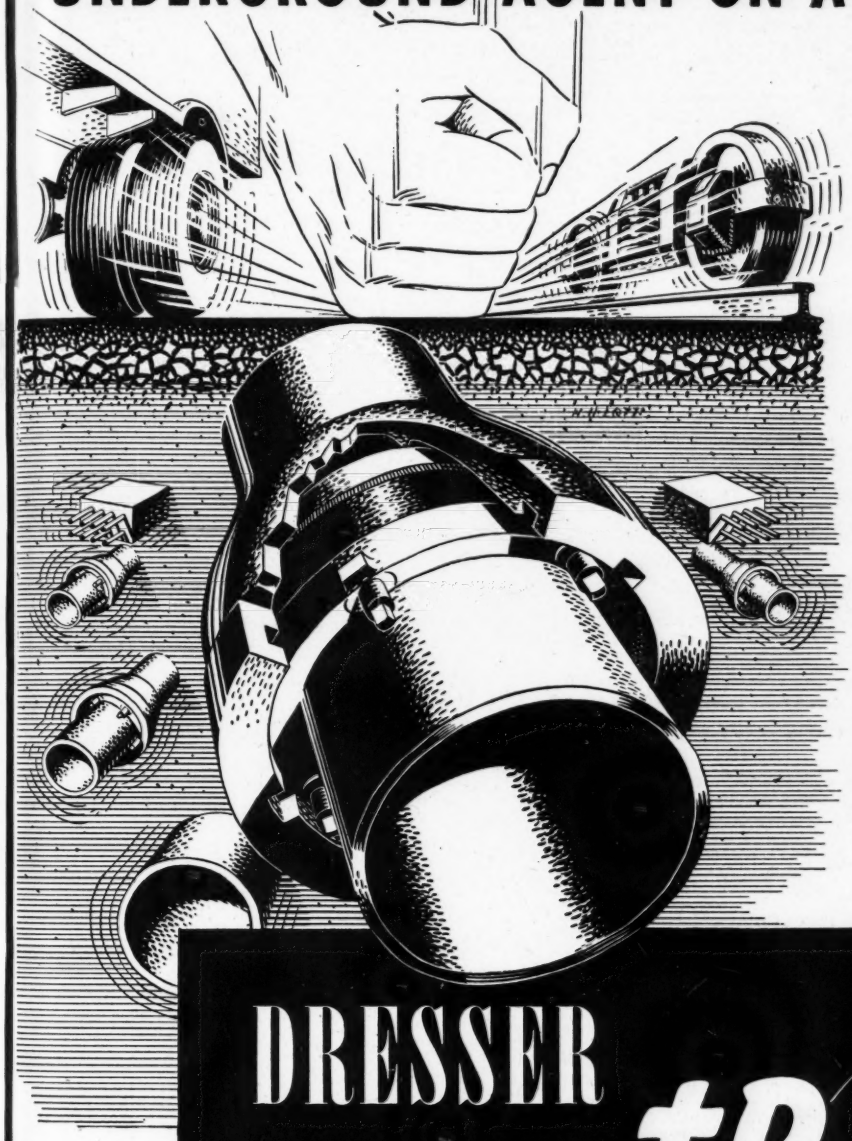

Thunderous tons of traffic shake the earth far below our city streets. The vast gridwork of transportation pipes for gas and water vibrates day and night. In one of our largest cities are over 7000 miles of gas mains alone, with a joint on the average of every twenty feet.

If a joint springs a leak, the street must be dug up; traffic is detoured; nerves are jangled with hammering, and the utility foots the expense.

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The Bellmaster Joint is an adaptation of the basic Dresser idea for flexible pipe couplings. This idea was a major contribution to the gas, oil and water industries, aiding them to give uninterrupted service from generation to generation. Another piece of fundamental engineering by one of the Dresser Industries.

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GAS

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Twenty-First Year of Publication

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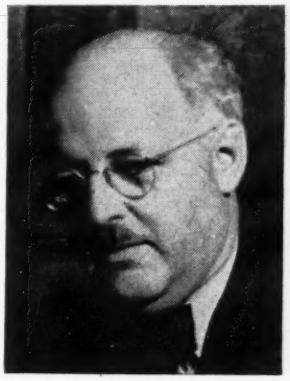
THERMALLY THINKING

By ELLIOTT TAYLOR, Washington Editor

Planned Publicity

NO doubt the natural gas industry is doing some heavy thinking on the subject of its attitude and activities in opposing the Federal Power Commission's race for absolutism in natural gas affairs; but none of the crowd that speaks to us in public seems to have turned up with just the right solution to the problem.

To our mind the answer is so obvious it is almost in danger of being overlooked; because what is needed more than any one thing is a good first rate intelligent publicity campaign.



Elliott Taylor

The primary aim of such a campaign should be to stop the commission from any further aggrandizement of its authority over either the production or the end uses of natural gas or oil, and to support the states in their struggle to retain jurisdiction over their own natural resources. It should not be confused with any industry promotion campaigns or plans now under consideration.

The necessity for such an activity is obvious. Because of its failure to use even the most rudimentary tools of approach to public confidence, the natural gas industry is regarded as a pushover by the bureaucrats of the Federal Power Commission. Unless a vigorous and intelligent fight is made at once, adverse congressional attention to the industry may be expected as a result.

Many believe that this may be natural gas's last chance to wage a successful fight in its own behalf. Once the Natural Gas Act has been amended and the Federal Power Commission given the jurisdiction that it wants over gas production and end uses, the battle will be lost. Rear guard actions through the Supreme Court may then provide interesting intellectual exercises for the legal staffs but only adverse decisions for the industry.

Those who are normally allies of the natural gas industry should not remain indifferent to or unaware of their common cause with gas in its resistance to Federal encroachment. All should be united into a common front; but the gas industry cannot afford to delay action in its own behalf until it enlists the support of others. This support will no doubt be forthcoming as, and to the extent that, the gas industry gives evidence of an ability to stage an impressive fight in its own interests.

A realignment with present allied industries is essential. At production and transmission levels the interests of natural gas are close to those of petroleum, natural gasoline, and liquefied petroleum gases. The common cause with manufactured gas on the other hand exists only at the distribution level, and even then is often a tenuous and insecure bond. Where manufactured gas companies are dominated by the coal and coke interests they are, in fact, in a position of thinly veiled antipathy to any expansion of natural gas service.

The coal industry in cooperation with railroads and railroad organizations has waged a most intelligent and forceful natural gas obstruction campaign. It is not an exaggeration to say that the opinions and the contentions early expressed by these anti-gas intervenors before the FPC have later been enunciated by justices of the United States Supreme Court.

Any campaign undertaken to amend or correct this dangerous trend should be a matter of primary concern to the entire natural gas industry; but in our opinion it should be organized quite apart from, and independent of, existing gas industry associations.

The definition of both intermediate and final objectives should be worked out and a suitable strategy to win those objectives decided upon. But the technical direction and the operational details of the campaign itself should be left in the hands of competent experts.

There are certain basic activities around which such a campaign must be constructed. Among them are the following:

1. **Establish and maintain a natural gas information center of unquestionable accuracy.**

   There is at present no central agency to which a researcher or editorial writer can appeal for reliable information or an enlightened opinion on broad industry matters. The industry needs such an agency without further delay. Information must be made available without question to any legitimate inquirer, regardless of whether his approach is to be friendly or unfriendly to the industry.

2. **Support the industry's friends and discredit its enemies.**

   This can be done by carrying on a campaign of unremitting exposure of any interests or individuals who rise as obstructionists to natural gas expansion. Railroads and coal maneuvers, for instance, should be discredited at every legitimate opportunity. It is advisable to stay out of any contest involving labor unions, although any misstatements of fact by unions should be refuted.

3. Identify natural gas publicity with public convenience and necessity only.

At all times the natural gas position must be patently on the side of the consuming public. The public is not interested in gas industry dividends nor in abstract considerations of constitutional rights. Repeated reliance on these issues only alienates interest and fails to enlist the support of consumers. Consumers merely want cheap gas and good service. The strongest natural gas case against FPC domination lies in proof and repetition of the claim that restrictions on production or end use can only result in high bills or poor service or both.

4. Divorce natural gas from undesirable fellow travelers.

Some manufactured gas companies have either wittingly or unwittingly played agent for the coal interests. Natural gas should assume no share of the burden of disproving either just or unjust accusations against either the manufactured gas or the electric utilities. Most of the mal-practices that brought the utilities into discredit and disrepute antedate by a decade the present period of natural gas expansion.

5. Capitalize the prestige and position of those sharing either common interest or common antipathies.

Enlist the aid and support the hands of all state bodies who have reason to be suspicious of the motives of the FPC. Use publicity as a means to explain differences between state and Federal viewpoints. Work in active cooperation with petroleum producers who have a common fear of Federal disruption of the economics of their industry.

While a publicity campaign can be aimed at certain objectives and geared to a certain prearranged tempo, it is in the final analysis the pace set by the opposition that dictates the running conduct of the campaign. Unless it can be entrusted to an organization or to individuals that know the tools of publicity and can be relied upon to use those tools in a workmanlike manner, it is best not undertaken at all.

There can be no guarantee that the endeavor will be successful any more than there can be any guarantee that a case carried up to the Supreme Court will be successful. But the suggestion is here presented that there still exists an opportunity and an avenue through which the natural gas industry may put up an intelligent and vigorous fight for its right to serve the public on the broadest possible terms.

Touting the Therm

THE new monthly bulletin of utility gas sales, product of the rejuvenated statistical bureau of the American Gas Association would appear on first glance to be acceptable evidence that the industry is about to move out of the statistical doledrums in which A.G.A. dereliction in the matter had long held it becalmed.

The bulletin which is the successor to the old monthly summary of gas company statistics now discontinued, contains one progressive innovation that is worthy of more widespread popularity than it now enjoys among operating gas utilities. That is the recording of gas sales in Therms, rather than in Mcf, the standard or measurement that has been quoted heretofore, and the unit on which most utility rates are based.

From a statistical standpoint the Therm is a more acceptable standard since it makes possible the summarizing of manufactured, mixed and natural gas sales in the same frame of reference. But aside from its usefulness to the statistician, we believe that the use of Therm as a unit has other advantages over the prevailing practise of measuring gas in terms of cubic feet. As a word that could very easily be imbedded in the public consciousness, it compares favorably with the familiar KWH of the electrical industry.

Very few consumers know exactly what a kilowatt hour is, but all recognize that it is the only unit of measurement in common use throughout the electrical industry. And it provides a simple means whereby the costs of electrical energy in one locality can be compared with those in other communities.

There is no such easy comparison possible in considering the costs of gas in different areas. A list of distributing companies shows that the heat content of manufactured gas varies from a low of around 450 Btu in one community to a high of 590 in another. Natural gas may be as low as 800 Btu from one source and as high as 1275 from others. Mixed gas served will vary from 570 to 950 as between one combination and another, while liquefied petroleum gas is piped through town systems with a Btu content running as low as 500 and as high as 3000. Since any comparison of rates quoted in Mcf would first require adjustments for the heat content of the gases, an easy and intelligent understanding by the layman is just about out of the question.

An industry expert, addressing a group of laymen, recently took 160 words to explain that on a heat unit basis gas costs twice as much in Boston as it does in Cleveland.

A low priced unit of measurement also has advantages in public relations that should not be overlooked. When a user of electricity mentions that he is heating water for a cent, or a cent and a half he merely means that he is getting that rate per KWH. Probably neither he nor his audience knows exactly how much that is per bath or per shave, but it sounds ridiculously low priced.

Similarly if gas rates were based on the Therm, natural gas at $1 per Mcf would be thought of as selling at 10¢. We believe that no competent utility man would question the desirability of having his product accepted as low priced without the necessity of too frequently proving the point.

Simplicity and directness in the statement of natural gas industry facts can never be overestimated as an instrument for the cultivation and maintenance of consumer goodwill. Experience has shown that public misapprehensions and misunderstandings have been far more productive of bad relations than have any so called exposures of the inside workings of utility operation.

The preponderance of advantages are very much in favor of the Therm as a standard unit of gas measurement, and if its adoption by the statistical bureau serves as an impetus toward its more universal use throughout the industry that bureau can pride itself on having performed a bonus service to natural gas utilities and natural gas users alike.

Highlights

Apprehension is growing in gas producing areas, according to a report from the Independent Natural Gas Association of America, over the far-reaching effect of recent decisions of the United States Supreme Court. In the Canadian River Gas Co. case the Court (April 2) affirmed an order of FPC pegging the price of natural gas produced by the Company at actual cost of production. The decision extends the rate-making power of FPC from the end of the line to the mouth of the well. (See page 9.)

•

On April 26 WPB authorized the manufacture of 58,000 additional domestic type electric ranges. The order came on the heels of Chairman Krug's statement that military orders will be cut back 12 to 15% over the next three or four months "no matter how long the bitter process of cleaning up in Europe will take."

•

In the United States Circuit Court of Appeals the petition by the Department of Conservation and the Public Service Commission of the State of Louisiana to set aside a certificate of public convenience and necessity granted Memphis Natural Gas Co. by FPC on Nov. 21, 1944 was denied. The petitioners sought rescindment of the certificate on the ground that it would "permit the withdrawal of gas, an irreplaceable natural resource, for burning under boilers, an industrial use that is regarded as inferior and wasteful. . ."

•

Tennessee Gas and Transmission Co., according to reports, last month proposed the largest public financing ever to be undertaken by a natural gas pipeline company: $57,500,000 of which $15,000,000 would be in bank loans. (See page 22.)

•

Teachers of home economics throughout the nation during April and May will receive wall charts and floor plans of the New Freedom Gas Kitchen, focal point in the industry's drive in its expanded national advertising and promotion campaign. Features of the enlarged kitchen design being distributed for classroom use are perfect "U" plan design, close coordination of gas refrigerator, gas range and sink, plentiful use of glass.

•

Natural Gas for Wisconsin: This stormy debate neared its climax April 19 when the Judiciary Committee of the State Assembly went on record, 6 to 5, against repeal of the State's gas obstruction laws. These laws require (1) that natural gas may not be piped into any community without that community's consent; (2) a tax of 7¢ per Mcf on natural gas. Two opportunities for favorable action still exist. One would occur when and if the repeal bills are reported out by the Judiciary Committee for vote by the Assembly; the other when the Senate Judiciary Committee takes action upon the two identical repeal bills introduced before that body.

Meanwhile public pressure for the introduction of natural gas into Wisconsin is growing day by day. One instance of this was the action of the Engineers' Society of Milwaukee, which comprises 1100 engineers in all branches of industry, which went on record April 22 in favor of bringing natural gas to Milwaukee at the earliest possible date.

•

The Texas house of representatives revenue and taxation committee last month gave a 12 to 2 unfavorable report to a bill taxing natural gas pipelines 1c per Mcf of gas carried.

•

Frigidaire Division of General Motors, looking towards the day when it can again sell refrigeration and air conditioning equipment, last month announced a three-phase campaign for its 1945 advertising with the theme, "Look to the Favorite —Look to Frigidaire." First phase, a continuation of the wartime "service" series; second phase stresses Frigidaire's desirable features; the third is an institutional series which claims first choice among commercial users.

•

FPC in order to insure adequate gas supply for the Appalachian area next winter, last month authorized Panhandle Eastern Pipe Line Co. to construct facilities that would increase its daily deliveries by 50 MMcf. Present deliveries are 333 MMcf. The new construction, including pipeline and compressor station addition, will cost $8,325,000. Completion is expected by Nov. 1. (See page 51.)

•

Operating revenues of the larger privately owned electric utilities, according to FPC figures released March 15, totalled in 1944 $3,110,153,000 a 4.7% rise over 1943 revenues of $2,970,711,000.

•

Two important manufacturers of gas and electric appliances were brought together on April 25 when A-B Stoves, Inc., Battle Creek, Mich., became the A-B Stoves Division of the Detroit-Michigan Stove Co., Detroit.

•

The Detroit City Council has decided to repeal the "20%" tax ordinance originally designed to absorb Detroit Edison's 1944 liability for Federal excess profits taxes. The recent decision of the Circuit Court in Wayne County, Mich., holding the order unconstitutional, will not be appealed.

•

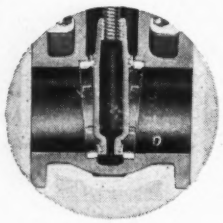
According to OPA surveys, inventories of the four rationed type stoves in stock have dropped between June 1, 1944 and Dec. 1, 1944 as follows: oil heating stoves from 96,500 to 57.000; gas heating stoves from 181,000 to 116,000; oil cooking stoves from 67,000 to 36,000.

WALWORTH PRESENTS

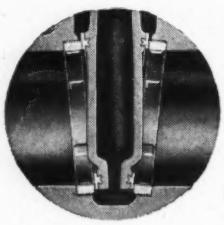
A New Line of IRON BODY GATE VALVES

with screwed or flanged ends

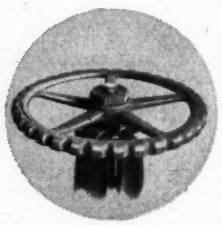
... *8 Outstanding Features*



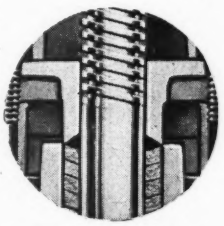
Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



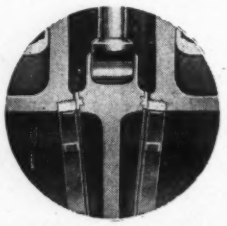
Seat Rings of end-seated type are screwed into the body.



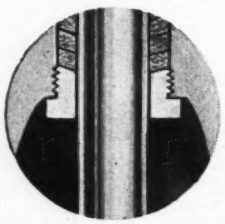
Sure-Grip Malleable handwheel for non-skid gripping even with heavy gloves.



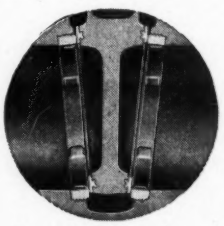
Brass Liner on Glands assures greater resistance to corrosion and scoring.



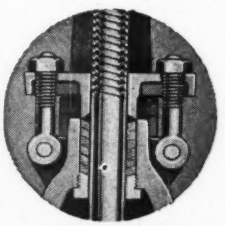
T-head disc-to-stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze back-seat bushings in bonnets of OS&Y valves. (As soon as W.P.B. Limitation order permits.)



Solid Web Type disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

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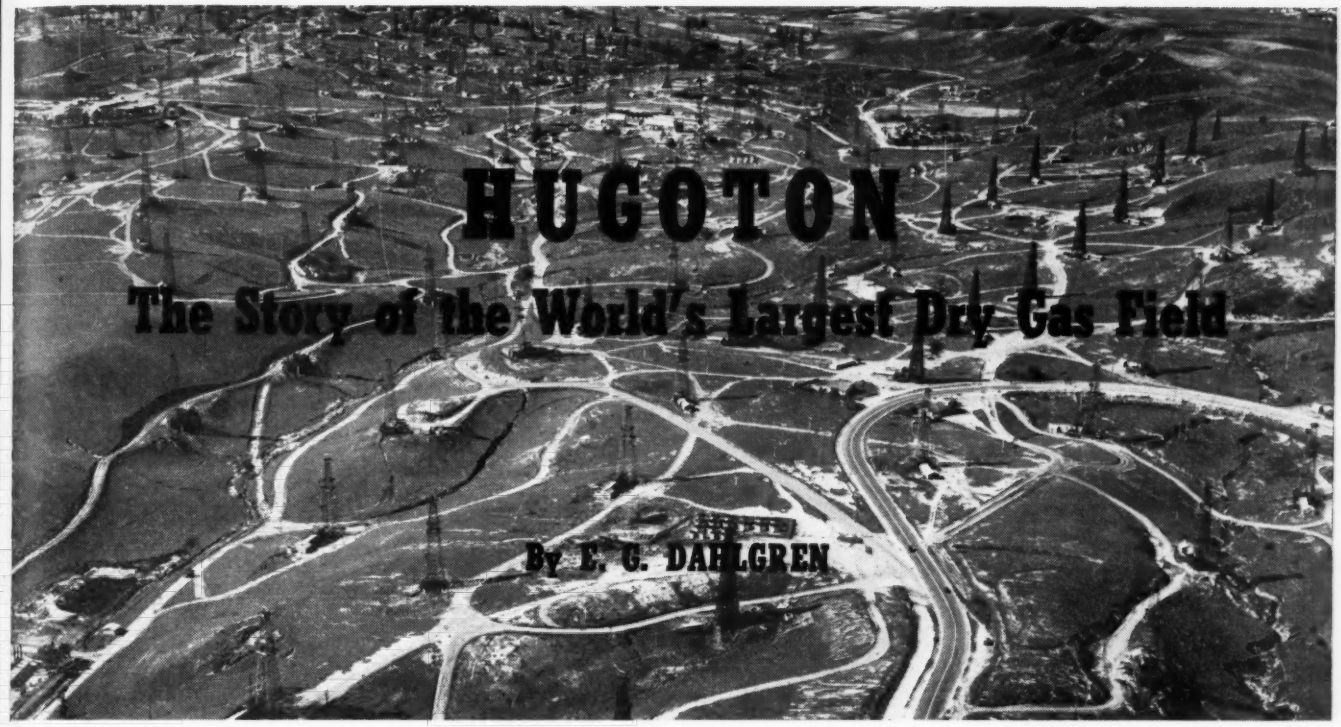


HUGOTON

The Story of the World's Largest Dry Gas Field

By E. G. DAHLGREN

DRILLING activity, spurred by war demands, plus agitation for more pipeline outlets are focussing attention on the tri-state Hugoton-Guymon natural gas field in Kansas, Oklahoma, and Texas. Recent estimates of nearly 3,850,000 acres, or over 600,000 square miles, make the field the largest one in the world from the standpoint of area. Only the Panhandle gas field, just a few miles south of the Hugoton-Guymon field, exceeds it in the matter of original reserves. Approximately 850,000 acres are considered noncommercial to drill, based upon present conditions in the field.

General Figures

The field is approximately 150 miles long from north to south and is about 35 miles in width.

Reserve estimates of the field vary from 8,500,000 cu. ft. per acre to almost 12,000,000 cu. ft. per acre. One estimate for the field is a total of 26.6 trillion cu. ft. with a 50 lb. abandonment pressure.

The field has a total deliverability of 1,629,700,000 cu. ft. per day, at an operating pressure of 312 lbs. gauge, and a market demand of between 465,440,000 and 428,376,000 cu. ft. per day.

As of Jan. 1, 1945 the developed acreage of the Hugoton field is as follows:

State	*Acres*
Kansas	220,094
Oklahoma	110,000
Texas	22,400
	352,494

The field is about 150 miles long from north to south and has a width of about 35 miles. Drilling activity is continuing with about 95 drilling operations. About 40 operations are under way in Kansas, 31 in Texas county, Okla., and 24 in Sherman and Hansford counties, Texas.

A survey (Aug. 15, 1944) of the acreage ownership (Table 1) within the limits of the field by companies shows the Phillips Petroleum Co. holding over 500,000 acres as the largest holder of acreage. Over 335,000 acres are held in Hansford and Sherman counties, Texas, with 156,000 acres held in Texas county, Okla. The Cities Service Gas Co. is the next largest holder of acreage with nearly 300,000 acres. Over two-thirds of this total or 207,000 are held in Texas county, Okla. The balance of the Cities Service acreage is held in Kansas. The Panhandle Eastern Pipe Line Co. is well situated with approximately 260,000 acres. Nearly 100,000 acres are held in Texas county, Okla., with the balance held in Kansas.

With little development thus far the Stanolind Oil and Gas Co. holds over 129,000 acres scattered throughout the field in the three states. The Northern Natural Gas Co. holds approximately 128,000 acres with more than 82,000 acres held in Stevens county, Kans. The Republic Natural Gas Co. has over 146,000 acres with 83,000 acres in Texas county, Okla. and more than 54,000 acres held in Stevens county, Kans. The Peerless Oil and Gas Co. has nearly 102,000 acres in Texas county, Okla. and approximately 18,000 acres in Seward county, Kans.

Other companies with large acreage holdings are the Skelly Oil Co., Columbian Fuel Corp., Texas Co., Magnolia Petroleum Co., and Don Harrington of Amarillo.

TABLE 1. ACREAGE OWNERSHIP OF HUGOTON GAS FIELD

Company	*Acres*
Phillips Petroleum Co.	500,000
Cities Service Gas Co.	300,000
Panhandle Eastern Pipe Line Co.	260,000
Stanolind Oil and Gas Co.	129,000
Northern Natural Gas Co.	128,000
Republic Natural Gas Co.	146,000
Peerless Oil and Gas Co.	102,000

Production Data

As of Jan. 1, 1945, the total gas production of the tri-state field was approximately 516 billion cu. ft. At the present time (the fore part of April) 630 gas wells have been completed. In Kansas 404 wells have been completed in the eight counties of Finney, Haskell, Kearney, Grant, Stanton, Stevens, Seward, and Morton. In Texas county Okla., 182 wells have been drilled, and 44 wells have been drilled in the south end of the field in Sherman and Hansford counties, Texas.

The Kansas portion has produced about 84%, with Oklahoma's production nearly 16%. With the Texas development getting under way last year, its production of 1.097 billion is only .2% of the grand total.

The largest gas well is the Southwestern Public Service Co.'s Safranko No. 1 well located in Section 1, T. 3 N., R. 14 ECM in Texas county, Okla. This well was completed with an initial production of 52,980,000 cu. ft. This well also enjoys the distinction of having the largest total production with a total 4,559,000,000 cu. ft. up to Jan. 1, 1945. Many other wells have total recoveries from two to three billion cu. ft. at the same date.

It is interesting to note the following average initial productions per well: Kansas—12,000,000 cu. ft.; Oklahoma—19,500,000 cu. ft.; and Texas—12,900,000 cu. ft. These figures are on a daily basis.

Reserve Estimates

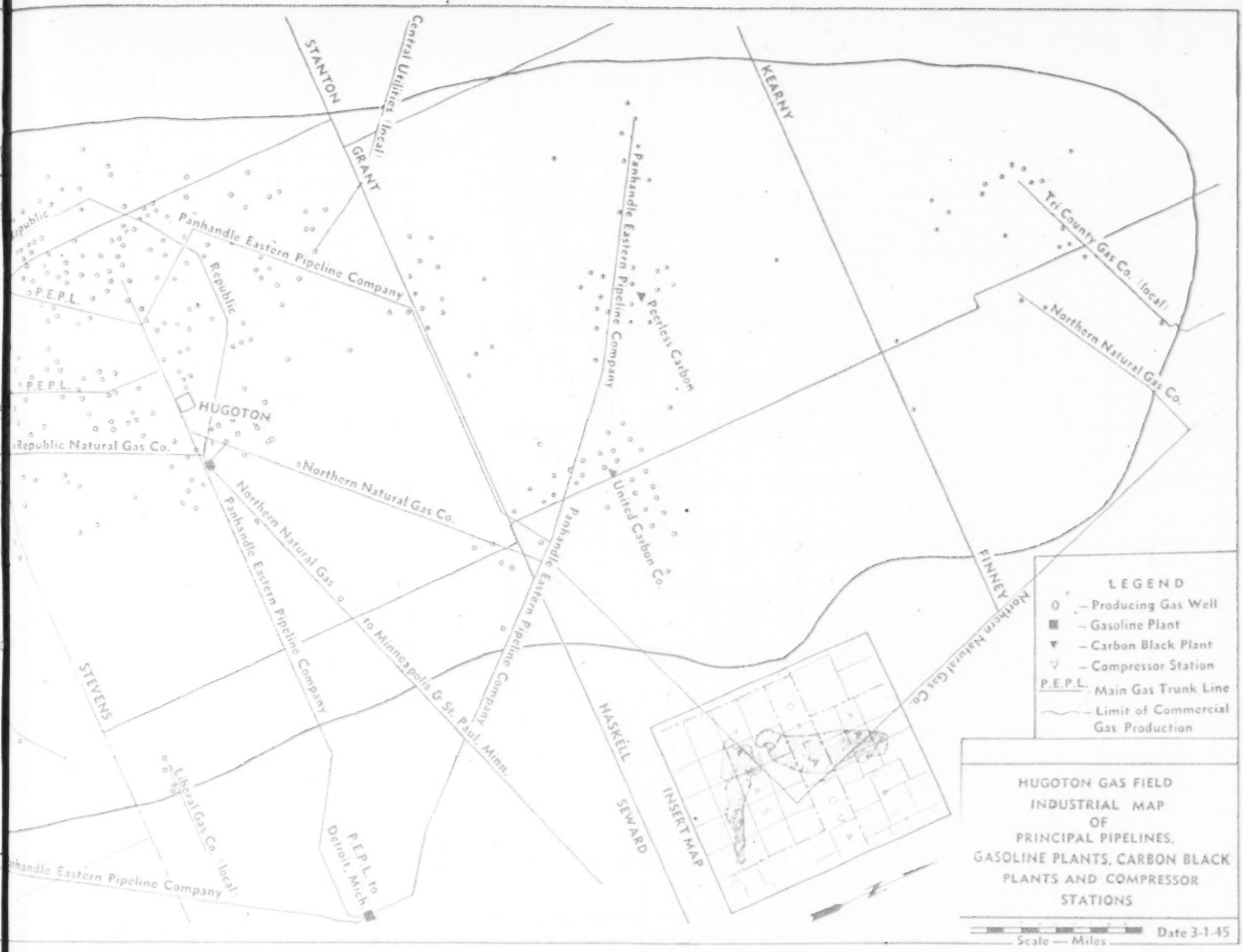
Many reserve estimates of the field have been made throughout the years. These estimates vary from 8,500,000 cu. ft. per acre to nearly 12,000,000 cu. ft. per acre. One estimate for the tri-state field is a total of 26.6 trillion cu. ft., with an abandonment pressure of 50 lbs. The Kansas portion is estimated to contain 11.9 trillion, with Oklahoma and Texas with 8.5 and 6.2 trillion, respectively. The grand total includes the 1.5 trillion cu. ft. estimated in the non-commercial portion of the field. The total acreage of 3,850,000 acres is divided as follows: Kansas — 2,000,000; Oklahoma — 1,100,000, and Texas—750,000.

As the deliverability factor is so important, it is of interest to note that the field has a total deliverability of 1,629,700,000 cu. ft. per day, at an operating pressure of 312 lbs. gauge. The Kansas total is 740 million cu. ft., or a per well average of 1,730,000 cu. ft. The Oklahoma total is 703 million, or a per well average of 3,800,000 cu. ft. The Texas total is 186,700,000 cu. ft., or a per well average of 4,270,000 cu. ft.

Market demand hearings held in March by the State Corporation Commissions of Kansas and Oklahoma indicate a daily market demand in April of 465,440, cu. ft. and 428,376,000 cu. ft. in May, based upon nominations filed by the purchasing companies. No nominations have been required from the Texas portion of the field, as the only restriction is that production be held to within 25% of the daily open flow capacity of the well. Data for 21 days in March indicate that over 28 million cu. ft. of gas is being produced in the Texas portion. Approximately a half-billion cu. ft. of gas will be produced per day in April throughout the field.

Early History

In delving into the early history of the field, the first deep well in southwestern Kansas was drilled by the Traders Oil Corp. on the Boles farm, located in Section 3, T. 35 S., R. 34 W., a few miles west of the town of Liberal in Seward county, Kans. The well was started in 1919 and reached a depth of 2919 ft. by the summer of 1920. No oil was reported, but gas showings were found between 2581 and 2755 ft. The hole was plugged back to the latter depth and completed in Dec., 1922 for a gas well with an open flow volume estimated at 5 to 10 million cu. ft. per day. This well is considered by many to be the discovery well.



During 1922 the Home Development Co. drilled Allison No. 1, Section 4, T. 1N., R 12E., Texas county, Okla. to a depth of 3040 ft. Gas was found at about 2700 ft. and the well supplied the nearby town of Texhoma with gas for a number of years. In 1924 the Seward Oil and Gas Co. completed Seeley No. 1, Sec. 20, T. 33S., R. 33W., Seward county, Kans. at 2764 ft. for a small gas well.

In 1926 an oil exploration campaign occurred in Texas county, Okla., with seven test wells being drilled. The Wilcox Oil and Gas Co.'s Hovey No. 1, Sec. 21, T. 4N., R. 14E. was plugged back and completed as a gas well, with a reported volume of 4,700,000 cu. ft. As a part of this exploration campaign, W. M. McKnab and the Independent Oil and Gas Co. commenced the Crawford No. 1 in Sec. 31, T. 33S., R. 37W. in Stevens county, Kans. After more than a year of drilling, gas was discovered in May, 1927. The well was drilled to 3502 ft. and then plugged back to 2620 ft. where it was completed for a reported daily initial open flow of six million cu. ft. and a rock pressure of 435 lbs. Several consider this well as the discovery well of the Hugoton-Guymon field. Three more wells were drilled in 1928 and 1929. By the end of 1930, a total of 108 gas wells were drilled in Stevens and Morton counties in Kansas. Lack of markets and the depression resulted in about 25 wells drilled in Kansas from 1930 until 1936 when 26 wells were drilled. In Texas county, Okla. only nine wells were drilled up until 1938, when the Republic Natural Gas Co. started developing its holdings.

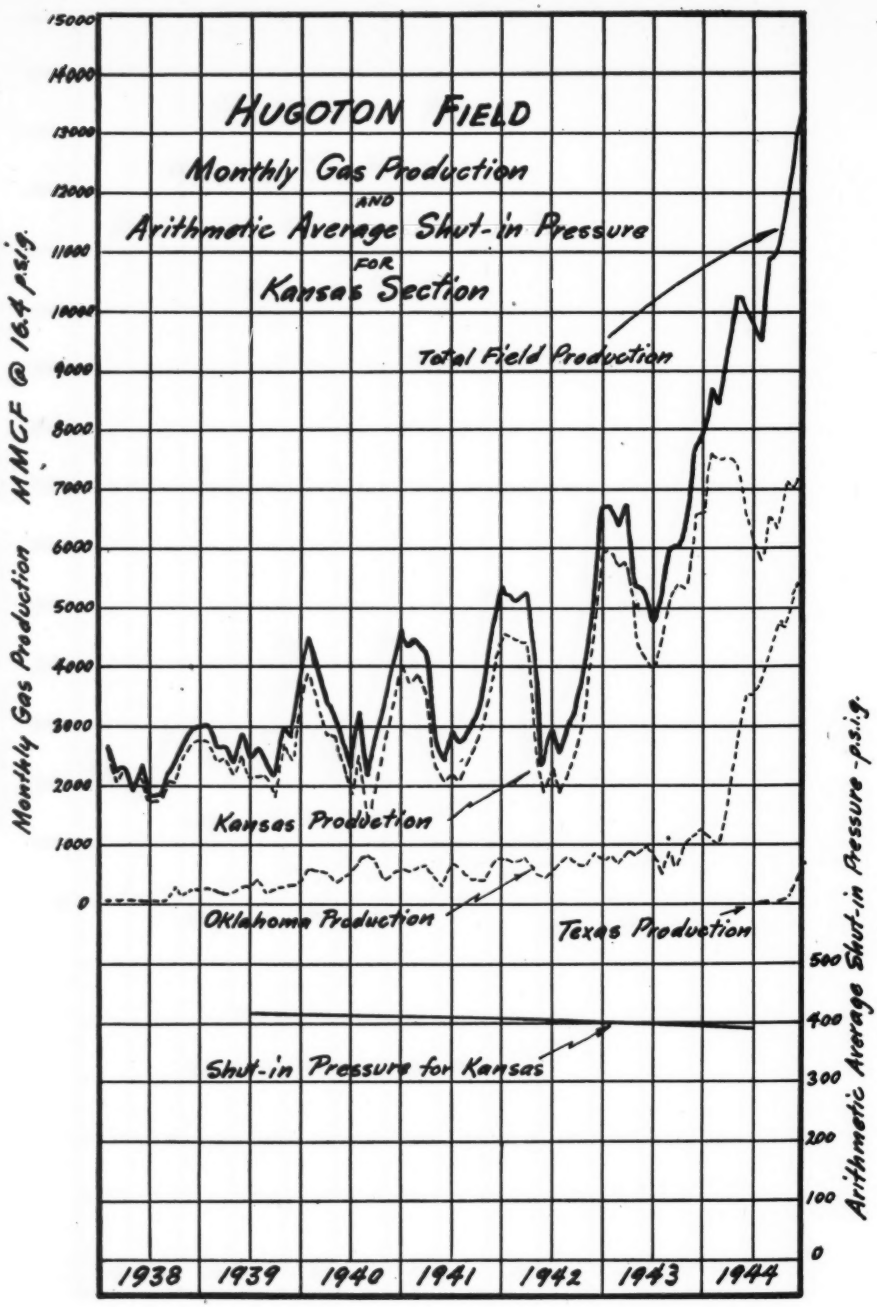
Geological Structure

The rocks which form the gas reservoir of the Hugoton-Guymon field are the dolomite beds of the lower part of the Sumner group and the dolomite and limestone beds of the upper part of the Chase group. The Sumner and Chase groups are part of the Big Blue series of the Permian system. Garlough and Taylor[1] have subdivided the groups into three gas producing zones separated by red shale beds. The first zone is known as the Herington which has a thickness of 100 to 120 ft. The middle zone is the Winfield limestone which has a thickness of about 40 ft. The Towanda, Fort Riley, and upper Florence limestones are believed to comprise the Fort Riley zone with a thickness of about 100 ft. The total thickness of the three zones is about 250 ft., but the thickness of actual gas-producing formation is much less.

The structural attitude of the gas-producing rocks is that of a generally eastward dipping homocline or monocline. The Winfield limestone is more than 800 ft. above sea level at the west edge of the field and 300 ft. above sea level at the east edge. The field is generally considered a stratigraphic trap with the gas being trapped by the pinching out westward and northwestward of the gas bearing rocks and their replacement by relatively impermeable red shale and siltstone.

The rock pressure of the field is subnormal. In the early days of its

[1]John L. Garlough and Garvin L. Taylor—"Hugoton gas field etc." Stratigraphic Type Oil Fields—A.A.P.G.—Dec., 1941—p. 78.



development the initial pressure was commonly considered to be 440 lbs. per sq. in. An examination of the March, 1945 allowable schedule of the Kansas Corporation Commission shows present pressures ranging from 370 to 420 lbs. The lowest pressure listed was 356 lbs.

Drilling Methods

Rotary drilling tools are usually used from the surface to approximately 2450 ft. or near the top of the Herington dolomite where the first gas is generally encountered. After the producing string is run, cable tools are usually used to complete the well.

In the past year some wells have been completed with rotary tools. Pipe has been set on bottom and gun perforated in the gas zones. From 500 to 600 ft. of surface casing is run and cemented to protect the fresh water zones and from 2300 to 2700 ft. of casing is run for the production string. No tubing is used as the wells make very little, if any, water.

As the producing zones may be distributed through a vertical distance of approximately 400 ft., all open hole, some wells have the operating problem of having the softer formations subject to caving, thereby shutting off the gas flow. Clean out tools are used to remedy wells troubled with cavings. Nearly all the wells drilled recently have been acidized before completion. From 5000 to 25,000 gals. of acid in several stages have been used with excellent results in increasing the open flow volume.

Pipeline Outlets

The Northern Natural Gas Co. in 1930 provided the first pipeline outlet in the Kansas portion of the field. (See Table 2) This line extends to Omaha, Nebr. and Minneapolis, Minn., and serves at wholesale about 200 communities in Nebraska, Iowa, South Dakota, and Minnesota. The Northern Natural Gas Co. has taken over the operation of the Argus Natural Gas Co.'s 8-in. line which supplies Garden City and Dodge City, Kans. and intermediate towns.

The Liberal Gas Co. has a 6-in. line which supplies the city of Liberal, Kans.

The Panhandle Eastern Pipe Line Co. with a main 24-in. line with numerous loops supplies gas to Missouri, Illinois, Michigan, and Ohio. The Federal Power Commission recently granted request for additional facilities to supply additional gas for war industries in the East.

The Tri-County Gas Co. has two 6-in. lines extending to Scott City, Kans., where these lines hook up with the line of the Kansas-Nebraska Natural Gas Co., which extends to central and western Nebraska. The line also serves about 20 Kansas communities.

The Central Gas Utilities Co. 6-in. line supplies gas to Lamar, Colo. and adjacent cities in Colorado.

One of the big factors in the development of gas production in Texas is the completion last year of the 26-in. line of the Cities Service Transportation and Chemical Co. This line extends from a compressor station north of Guymon for a distance of 230 miles to Blackwell, Okla., where the line connects with the system of the Cities Service Gas Co. A gathering system has been built to connect the wells of the Cities Service Gas Co. The Cities Service Co. nominated a total of 190 million cu. ft. per day in April through this system on a two lb. base.

Gathering and Field Utilization

The Republic Natural Gas Co. owns its own gathering system which consists of a 67 mile loop of 14 in. pipeline. The Republic line gathers gas from its own wells and delivers it to the Northern Natural Gas Co.

The Peerless Gas Co. and the United Carbon Co. with small gathering systems supplies gas for two carbon black plants located in the field. The Peerless plant near Hickok in Grant County, Kans. has a daily capacity

of 3,800,000 cu. ft. The United Carbon plant at Ryus, Grant county, has a daily capacity of 23,000,000 cu. ft. The Cabot Carbon Co. plant at Guymon, Texas county, Okla. has a daily capacity of about 16,000,000 cu. ft. The Cabot company has been recently granted an application to build a channel process plant of 30,000,000 cu. ft. capacity. The Cabot company also furnishes about 6,000,000 cu. ft. of gas to the General Atlas Carbon Co. plant in Texas county.

In Texas county, Okla. the Southwestern Public Service Co. serves Guymon and other communities through its gathering and distribution system.

The Phillips Petroleum Co. gathers gas from its wells and delivers the gas to the Panhandle Pipe Line Co. system at its Hansford station, where gas is also received from the Phillips properties in Hansford and Sherman counties in Texas. The Republic Natural Gas Co. has extended its gathering system into Texas county.

Gasoline Plants

Three natural gasoline plants are located in the field. The two Kansas plants are the Panhandle Eastern Pipe Line Co. plant at Arkalon near Liberal, and the Northern Natural Gas Co. plant at Hugoton. The Panhandle Eastern plant has a daily capacity of 275,000,000 cu. ft., while the Northern Natural plant has a daily capacity of 100,000,000 cu. ft.

The new Phillips Petroleum Co. plant in Hansford county, Texas has a daily capacity of 60,000,000 cu. ft. The natural gasoline content of the gas is about .035 gal. per 1000 cu. ft.

An average analysis is as follows:

Methane	74.26%
Nitrogen	14.27%
Ethane	5.81%
Propane	3.53%
Butane	1.48%
Pentane plus	0.65%

The gas is uniformly sweet throughout the field with the exception of a small area in Sherman county, Texas where the sulphur content ranges from 6 to 30 grains per 100 cu. ft. The BTU value averages about 1050.

Conservation and Proration

In common with large oil and gas fields, conservation and proration have been problems in this gigantic gas field. Surface wastage has never been a severe problem as there has been no oil production and no combination oil and gas wells as in the Panhandle gas field in Texas. About the only surface wastage in the past has been the blowing of gas wells to condition them for production tests.

The lack of markets and the problem of unconnected wells have been the chief irritants in trying to insure ratable taking and equity in withdrawals. Until 1936, wells were drilled on spacing of one well to 160 acres, but since 1936 all wells have been drilled on 640 acre spacing.

The Kansas portion of the field is being regulated under the provisions of the basic order issued Mar. 21. 1944. This basic order rescinded and superseded the prior basic order dated Oct. 28, 1942. The 1942 basic order superseded and rescinded the first basic order which had been in effect since Jan. 30, 1940. Following the passage of the natural gas law in 1935, attempts had been made to investigate the application of the law to the Hugoton field, but no hearings were held until 1938.

An examination of the basic order shows that the basic acreage unit in the proration formula is 640 acres. The acreage factor is the product of the number of acres attributable to a well divided by 640. Completed wells, with less than 640 acres, may include non-contiguous acreage located within a two-mile radius. A hearing may be held to determine whether non-contiguous acreage within a three mile radius from a well may be included.

Lease Development

A lease is considered undeveloped until a gas well has been completed and the owner or operator has tendered gas to a purchaser at the purchaser's pipeline. Before a well is entitled to an allowable, the operator must establish a tendership by constructing a pipeline to the line of a pipeline company or other purchasing facilities, or by filing an affidavit that the operator is ready to construct a line to a purchaser and sell gas at the prevailing price in the field. If an operator is unable to sell his gas, a hearing may be held to determine the factors.

As the proration formula takes into consideration the deliverability factor, the deliverability of each connected well is determined by producing the well into the pipeline for approximately 72 hours, during which time the working pressure at the well-head shall be maintained at 80% of the average shut-in well-head pressure of the field, or as closely thereto as operating conditions in the field will permit. The rate of flow is determined and the shut-in and working pressures determined in order to ascertain the deliverability. The deliverability of each unconnected well which is entitled to an allowable shall be estimated from its open-flow and deliverability for all wells in the field.

Determination of Well Quota

A well's quota is determined by the following method. The proration factor for the field is determined by dividing the total field allowable by the sum of the products of deliverability times the acreage factors of all the wells in the pool. The field proration factor is multiplied by the product of the deliverability times acreage factor for the well to obtain the well's allowable. By way of illustration, the March allowable schedule gives the Central Gas Utilities Co.-Leonard No. 1 well a gross allowable of 56,709,000 cu. ft. This allowable was computed by multiplying the product of its deliverability of 4,955,000 cu. ft. and the acreage factor of 640 acres by 11.444807, the re-

TABLE 2. PIPELINE OUTLETS FROM HUGOTON GAS FIELD

NORTHERN NATURAL GAS CO., Omaha—Serves 200 communities in Nebraska, Iowa, South Dakota, Minnesota. Terminus of line: Minneapolis and St. Paul, Minn. Through acquisition of Argus Natural Gas Co. also serves Garden City and Dodge City, Kans. through 8-in line.

PANHANDLE EASTERN PIPE LINE CO., Kansas City*—Through almost completely looped 24-in. line serves communities in Missouri, Illinois, Ohio, Michigan. Terminus of line: Detroit.

KANSAS-NEBRASKA NATURAL GAS CO., Phillipsburgh, Kans.—Serves gas at wholesale to 4 towns in Kansas, 40 in Nebraska. Distributes gas at retail in 21 towns in Kansas; 32 in Nebraska.

CITIES SERVICE TRANSPORTATION AND CHEMICAL CO.—Connects with system of Cities Service Gas Co., Bartlesville, Okla. through 230-mile, 26-in. line from compressor station north of Guymon. Cities Service has applied to FPC for permission to purchase this line.

LIBERAL GAS CO.—Through 6-in. line serves Liberal, Kans.

TRI-COUNTY GAS CO.—Through two 6-in. lines to Scott City, Kans. serves a number of Kansas communities.

CENTRAL UTILITIES GAS CO.—Through 6-in line serves Lamar, Colo. and adjacent cities.

*FPC on April 3 granted a certificate of public convenience and necessity to Panhandle Eastern to construct and operate facilities to increase the company's 333,000,000 cu. ft. daily delivery capacity of its main line by 50,000,000 cu. ft. per day.

lationship of the total gross allowable for March to the sum of all the deliverability-times-acreage-factor products.

Two market demand hearings are held each year. The first hearing covers the period from October 1st and March 31st inclusive, and the second hearing covers the period from April 1st to September 30th inclusive. Emergency demands during each allowable period may be taken care of by ratable increases in allowables for all wells. Overages and underages at end of allowable periods are carried over during the next period. All wells with overages in excess of three times their current allowable shall be shut in to make up overages. Underage will be canceled on wells with underages in excess of three times its current monthly allowable.

Deliverability tests and the 72-hour shut-in pressures of the wells are taken under the supervision of an engineer of the conservation division of the Kansas State Corporation Commission. It is interesting to note that the offices of the conservation division are in Wichita, while the State Corporation Commission office is at Topeka. A field engineer is located within the field.

Regulation of Oklahoma Section

The Oklahoma portion of the field is being regulated by order No. 17410 in Clause CD No. 861 of the Oklahoma Corporation Commission. Rules and regulations were originally established in order No. 16377 issued on May 5, 1943. Order No. 17410, issued on Dec. 27, 1944, contained a declaration of policy that rules and regulations be promulgated to prevent waste in production, to provide ratable taking, a uniform method of determining natural flow, and to allow each operator to produce his share of the gas and to produce ultimately the amount of gas originally underlying his land. This policy is essentially the same as that of Kansas.

Details of the order pertaining to allocations and the determination of deliverability, acreage factors etc. are practically the same as in Kansas. Acreage units are limited to 640 acres except that short sections near the Kansas-Oklahoma line may be communitized with adjoining 640 acre sections after a hearing to form units of not more than 800 acres. To this date the Oklahoma Commission has not issued any allowable schedules pending determination of acreage factors. Allowables will be made retroactive when determinations are made.

As indicated before, the Texas Railroad Commission has applied only the 25% restriction of open flow to production in the Texas portion.

An examination of the March allowable schedule of the Kansas Corporation Commission shows that the Central Gas Utilities Co. is connected to its five wells. The Liberal Gas Co. is connected to six wells owned by the Quinque Oil and Gas Co. The Northern Natural Gas Co. is connected to 155 wells owned by the following operators: Derby Oil Co., Helmerich & Payne, Kansas Natural Gas Co., Kuhn Brothers, Neuner-Kuhn, Northern Natural Gas Co., Panhandle Eastern Pipe Line Co., Pioneer Petroleum Co., Republic Natural Gas Co., Stevens County Oil and Gas Co., and the United Producing Co.

The Panhandle Eastern Pipe Line Co. is connected to 146 wells of the following operators: Benedum-Trees Oil Co., Columbian Fuel Corp., Kinney Coastal Oil Co., Kuhn Brothers, McKnab Oil and Gas Co., Panhandle Eastern Pipe Line Co., and partners, F. P. Parish, Pioneer Petroleum Co., Sidwell, Stevens County Oil and Gas Co., M. J. Sullivan, Royalty Depositors Corp., United Producing Co., and R. K. Wilson.

The Peerless Carbon Black Co. is connected to eight wells operated by the Columbian Fuel Corp. The Tri-County Gas Co. is connected to 33 wells operated by Ross Beach, Finker, Kansas Natural Gas Co., and the Kansas-Nebraska Natural Gas Co. The United Carbon Co. is connected to 38 wells operated by the United Producing Co. Ten unconnected wells are listed on the report as being operated by the Benedum-Trees Oil Co., Helmerich & Payne, Kuhn Brothers, and Orville Parker. The Skelly Oil Co. has drilled some wells in Texas County, Okla. which are now unconnected.

Tennessee Gas In $57,500,000 Financing Plan

THE largest public financing ever to be undertaken by a natural gas pipeline company, $57,500,000, was proposed in mid-April when Tennessee Gas and Transmission Co. filed a registration statement with SEC. The financing will include a bank loan of $15,000,000. Dillon, Read & Co. Inc., Glore, Forgan & Co., and White, Weld & Co. are to head the underwriting group.

The financing contemplates offering of $35,000,000 of first mortgage 3% pipeline bonds of Tennessee Gas and Transmission Co. and $7,500,000 of 5% preferred stock. In addition, the company contemplates placing a 7½ year term bank loan with the Chase National Bank of New York, the First National Bank of Chicago, the Continental Illinois Bank & Trust Company of Chicago, and Harris Trust & Savings Bank of Chicago. Proceeds of the financing will be used to refund indebtedness and to settle certain construction costs now undergoing audit.

Tennessee Gas last October completed finished construction of the longest large diameter natural gas pipeline in the world, running 1265 miles from near Corpus Christi, Texas, to the vicinity of Charleston, W. Va. The company supplies natural gas to United Fuel Gas Co., a subsidiary of Columbia Gas & Electric Co., and to Hope Natural Gas Co., a subsidiary of Consolidated Natural Gas Co. These two companies have supplied about 60% of all gas sold in the Appalachian Area of Ohio, Pennsylvania, Western New York and West Virginia. Under its contract with United and Hope, Tennessee Gas has agreed to sell them substantially all of the present capacity of the line for 20 years.

The line was constructed in record time, in 13 months, from the time the FPC issued a certificate of convenience and necessity until operations were begun October 31, 1944. The pipeline is operating at 100% of capacity and since the first of the year has been delivering a daily average of more than 205,000,000 cu. ft. of gas.

As the vital factor in enabling the war industries of the Appalachian Area to obtain adequate fuel supplies, Tennessee Gas has been requested by the War Production Board to increase its capacity 30 per cent, since even with the additional supply brought in by the new line there was a shortage of gas in the area last winter. The new facilities are expected to be in operation this coming winter.

AWARDS

• **Servel, Inc.,** Evansville, Indiana became the first three-time winner of the National Safety Council's "S" pennant for distinguished service to safety. The flag was presented by Forrest E. Long, executive manager of the National Safety Council, to Dr. Thomas Dobbins, medical and safety director for Servel, on the Billie Burke radio show.

• **The Cooper-Bessemer Corp.'s Grove City, Pa. plant** has been awarded a second renewal on its Army-Navy "E", in further recognition of outstanding production of diesel engines. The announcement was made by Admiral C. C. Block, USN.

• The **Rheem Manufacturing Co.'s** plant at Birmingham, Ala., has been awarded the Army and Navy "E".

DESIGN of the Goleta Dehydration Plant

By RICHARD H. HULL
Design Engineer
Pacific Lighting Corporation

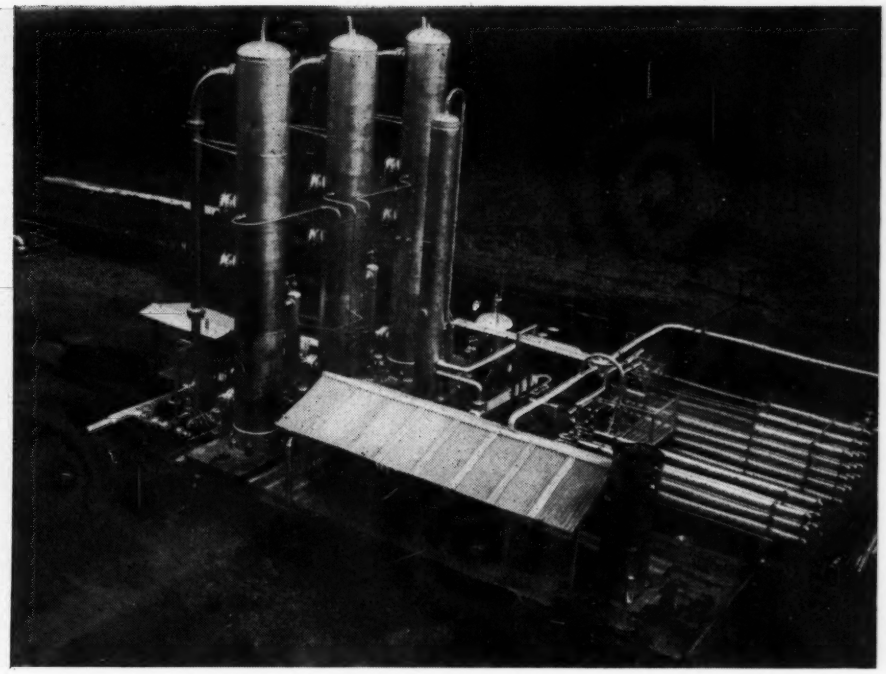


FIG. 1 (Right).
General View of the Plant

THE dehydration plant is located at Pacific Lighting Corp.'s compressor plant site in the Goleta gas field, about 10 miles west of Santa Barbara, Calif. Its purpose is the dehydration of the gas which is withdrawn from storage in the field and delivered into the Southern Counties Gas Co.'s 16-in.—1000 psig line for eventual delivery into the Los Angeles Basin Area.

During the winter, which is the normal withdrawal period, the ground temperatures along the line drop to about 54° F. To prevent water from condensing in the pipeline and also to prevent the probable formation of hydrates, it is necessary to lower the dewpoint of the gas to a point below the ground temperature. The dehydration plant is designed to handle 150,000,000 cu. ft. of gas per 24 hours and to depress the dewpoint approximately 40° F. below the incoming temperature. This incoming temperature is maintained from about 78° F. maximum to 70° minimum. If the temperature were allowed to drop below 70° F. there is the possibility of hydrate formation in the saturated gas ahead of the dehydration plant and consequent freezing of the piping. The gas is processed and delivered into the line near this temperature and the 40° depression gives a resultant dewpoint of about 38° F. maximum which is safely below the ground temperature.

Gas Flow and Control

The dehydration plant equipment and piping are designed to operate up to 1050 psig in order that the gas may be processed and metered into the line at 1000 psig. The gas enters the dehydration plant and is reduced from field pressure to a pressure of about 1025 psig by means of two regulators operating in parallel. The control pressure on the master regulators is taken from the meters downstream from the dehydration plant. This automatically compensates for plant pressure losses so that it is not necessary to juggle the regulated pressure to try to meet the desired delivery pressure. The regulators operate so that a low volume will be handled by one regulator only, with the second regulator opening automatically and the two equalizing when the first has reached near its capacity. An additional controller is set as a safety to prevent the regulators from building the pressure above 1050 psig into the plant.

After the pressure is reduced, the gas passes through cooling coils where it is cooled from field temperature to approximately 78° F. and then through mechanical separators which remove the free condensate. From the separators the gas flows through diethylene glycol contactor towers where it is intimately contacted with the diethylene glycol (called DEG for convenience) which absorbs the water vapor and a portion of the gasoline vapors. From the contactors the dry gas passes through regulators and is metered into the pipeline.

There are three contactor towers operating in parallel. These towers were designed each to handle 50,000,000 cu. ft. of gas per 24 hours at 1000 psig plus a 20% overload factor. The overload factor serves to take care of emergency demand or to, during normal operation, further depress the dewpoint. The contactors are 50 in. in diameter with a net shell length of 33 ft-7 in., and are built for a working pressure of 1070 psig. The gas enters at the bottom of the tower, passes through a baffle-nest which serves to remove any remaining free condensate, rises through a series of four bubble-trays where it is contacted with the DEG and flows out at the top of the tower through a mist extractor tray and a final baffle-nest which removes any DEG which might otherwise carry over with the gas in mist form.

In the outlet line from each contactor there is a motor valve which serves a dual purpose. The primary purpose is to equalize the gas flow through the contactors. This is ac-

Richard H. Hull

IN CONNECTION with the La Goleta-Los Angeles pipeline recently put into service by Southern Californian and Southern Counties Gas Companies, the Pacific Lighting Corp. has constructed a dehydration plant in the Goleta field designed to operate up to 1050 psig so that the gas may be processed and metered into the line at 1000 psig. The plant will handle 150,000,00 cu. ft. of gas per 24 hours.

RICHARD H. HULL has been designing compressor plants and other transmission facilities for Industrial Fuel Supply Co. and its successor company, Pacific Lighting Corp. since 1933. Prior to that time he served I.F.S. as division engineer at Ventura, Calif. ..A graduate of Stanford University in 1928, Mr. Hull did a trick with Ventura Fuel Co. before becoming affiliated with I.F.S. in 1931.

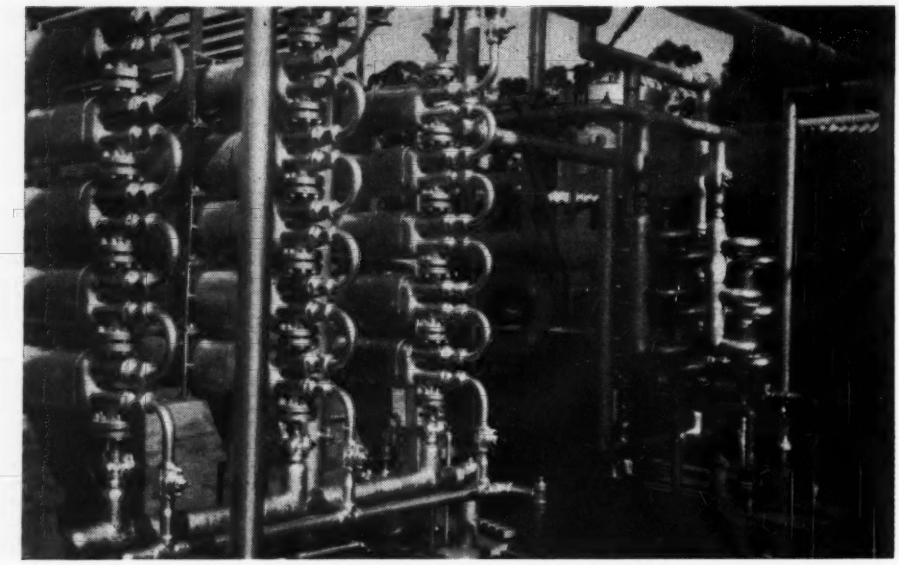


FIG. 2. Heat exchangers and pre-heaters (D. E. G.)

complished by controlling the motor valves with flow equalizer instruments, which in turn are activated by the differential across orifice plates set in the discharge lines from each contactor. The gas lines to and from the contactors are manifolded so that on low volume, 50,000,000 cu. ft. per 24 hours or less, any one of the contactors can be placed in service. As the volume is increased the second and third contactors can be placed in operation as necessary to handle the load. At any time two or three contactors are in service the flow equalizers operate to divide the load equally between them. The second purpose is to maintain a minimum back pressure of approximately 950 psig on contactors. In case the gas pressure in the line is pulled down unexpectedly the resultant increase in volume and velocity through the contactors would probably carry over the DEG with the gas stream and might even be great enough to damage the bubble-trays due to the high differential across them. By holding a high minimum downstream pressure, the back pressure controllers prevent any large pressure drop through the vessels.

Separator and Heat Exchangers

The DEG, combined with water and gasoline, from each contactor flows out into a 16-in. diameter by 13 ft.-0 in. float tank in which the proper level is maintained by means of a liquid level controller. From the individual float tanks the liquid streams are combined and pass into a gasoline separator tank. Here most of the gasoline separates from the DEG and is drained off through a trap to gasoline storage tanks. A certain amount of wet gas entrained in the DEG from the contactors is also released in the separator. This gas combined with gasoline vapors is released at the top of the vessel through a back pressure regulator and is piped into the boiler fuel system.

The DEG and water mixture are drawn from the bottom of the separator through a motor valve controlled by a liquid level controller, which has its float set at the interface between the DEG surface and the gasoline in the tank. It is then piped into a series of heat exchangers consisting of three parallel banks, each containing five G-Fin exchangers. From the line between the separator and the heat exchangers a portion of the cold DEG is by-passed through a coil in the top of the rectifier and then is returned to combine with the main stream into the exchangers. The cold coil in the top of the rectifier condenses rising vapor which serves as a reflux. In exchange the DEG passing through the coil absorbs an equal amount of heat. In the exchangers the DEG receives its first stage of heating from counter-flowing hot DEG returning from the rectifier to storage. The warmed DEG then passes through a set of pre-heaters, consisting of two parallel banks, each containing three G-Fin exchangers, where it is heated by steam to a temperature sufficient to evaporate the entrained water and any remaining small amount of gasoline. The outgoing temperature of the DEG is controlled by a temperature operated motor valve set in the steam line to the pre-heaters with a control bulb in the DEG line. This motor valve can be set to maintain any desired temperature in the DEG and it achieves this result by increasing or decreasing the quantity of steam admitted to the pre-heaters.

Rectifier and Reheater

From the pre-heaters the flashing mixture of DEG and water vapor is piped into the rectifier, or still. This is a column 26 in. in diameter by 29 ft.-10 in. net shell length, built for working pressure of 50 psig, which contains 14 bubble-trays and six trays of other types. Most of the water

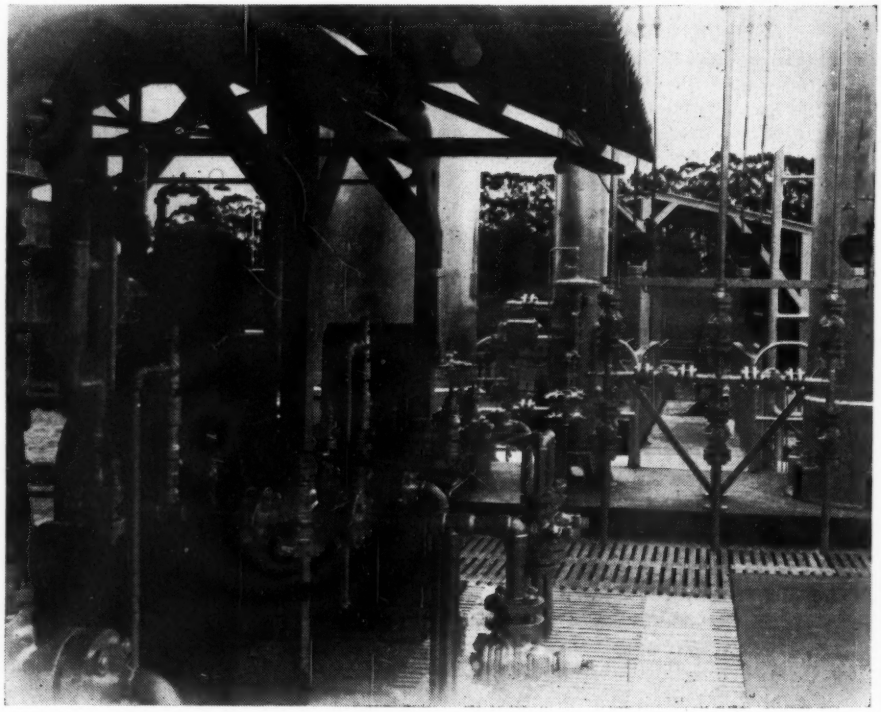


FIG. 3. Diethylene glycol piping manifolds at pumps and contactors.

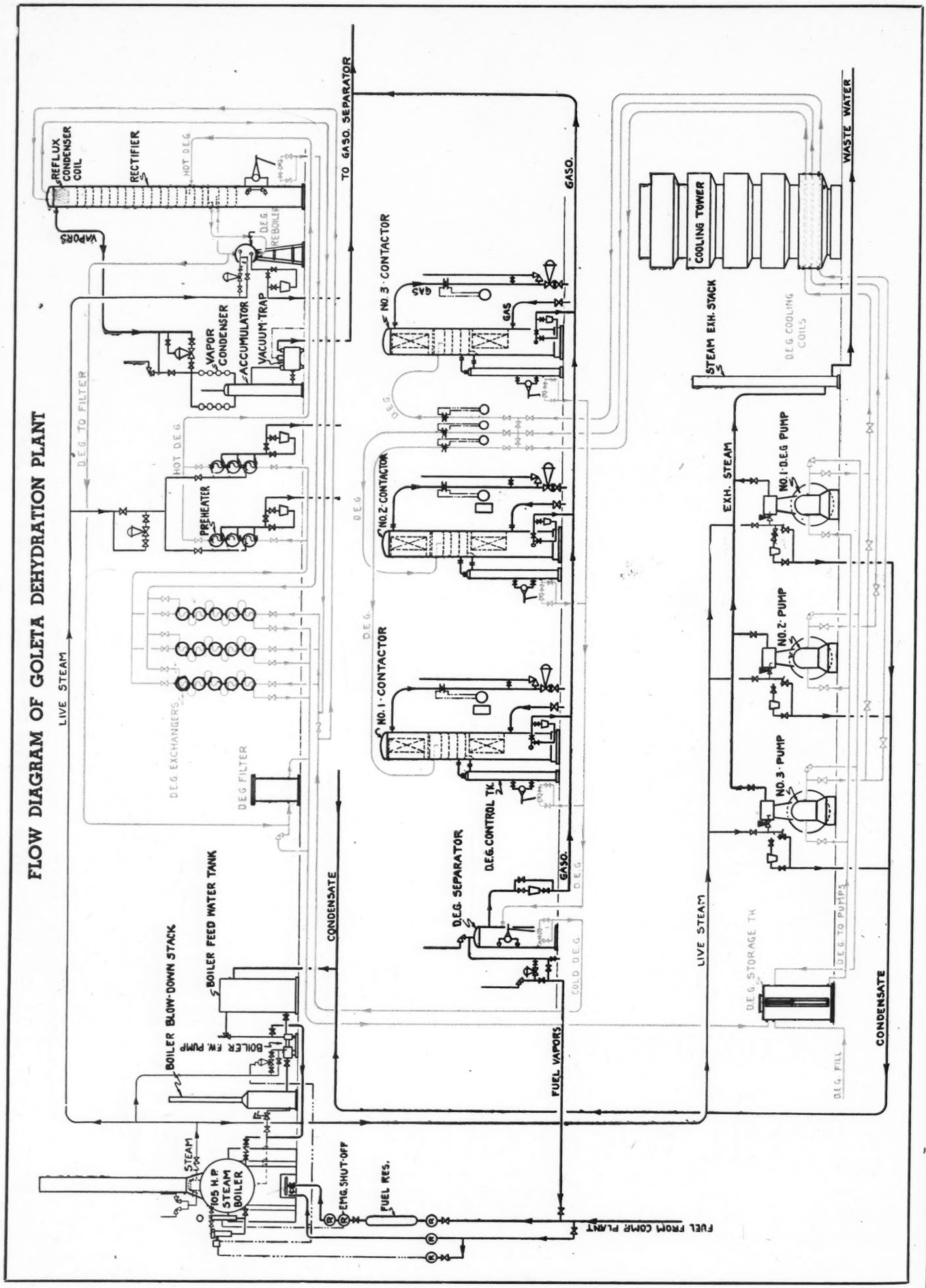
River Crossing

PIPE LINE CONSTRUCTION

THE W.A.BECHTEL COMPANY

Constructors

SAN FRANCISCO


FLOW DIAGRAM OF GOLETA DEHYDRATION PLANT
REFLUX CONDENSER COIL
RECTIFIER
HOT D.E.G.
D.E.G. REBOILER
VAPORS
VAPOR CONDENSER
ACCUMULATOR
VACUUM TRAP
TO GASO. SEPARATOR
GASO.
NO. 3 - CONTACTOR
GAS
COOLING TOWER
WASTE WATER
STEAM EXH. STACK
D.E.G. COOLING COILS
D.E.G. TO FILTER
HOT D.E.G.
PREHEATER
D.E.G.
NO. 2 - CONTACTOR
EXH. STEAM
NO. 1 D.E.G. PUMP
NO. 2 - PUMP
NO. 3 - PUMP
LIVE STEAM
D.E.G. EXCHANGERS
D.E.G. FILTER
NO. 1 - CONTACTOR
D.E.G. CONTROL TK.
D.E.G. SEPARATOR
GASO.
D.E.G.
COLD D.E.G.
D.E.G. STORAGE TK.
D.E.G. TO PUMPS
D.E.G. FILL
CONDENSATE
LIVE STEAM
CONDENSATE
BOILER FEED WATER TANK
BOILER BLOW-DOWN STACK
BOILER F.W. PUMP
FUEL VAPORS
STEAM
105 H.P. STEAM BOILER
EMG. SHUT-OFF
FUEL RES.
FUEL FROM COMP. PLANT

vapor is separated from the DEG in the bubble-trays when it first enters the column. The lean DEG is then drawn off and passed through a reheater, which is a 13 in. x 10 ft.-0 in. horizontal shell and tube type of heat exchanger, where its temperature is again raised by steam to a point where any remaining water is vaporized. The temperature of the DEG from the reheater is fixed by a temperature control regulator set in the steam line to the reheater with the control bulb in the outgoing DEG line. From the reheater the DEG is returned to the lower part of the rectifier to allow this final vapor to escape.

The water vapors, which are driven off in the rectifier, rise through the column and when they contact the cold condenser coil in the top, a portion of them are condensed as a reflux. The balance of the vapors are released through a back pressure regulator which maintains the desired operating pressure on the vessel. These vapors are then condensed in a set of air-cooled fin tube exchangers and the liquid collected in an accumulator. Here the quantity of liquid can be checked and it can be tested for any content of DEG, gasoline, etc., which might carry over with the vapors, thus showing whether or not the rectifier is properly operating. The hot lean DEG is released from the bottom of the rectifier through a motor valve operated by a liquid level controller, flows through the DEG heat exchangers where it imparts heat to the incoming cold DEG-water mixture, and then is piped to a storage tank.

In order to remove any dirt, carbon, etc., which may accumulate in the DEG, the line between the reheater and the rectifier is tapped and a small stream of DEG is drawn off and passed through a filter. This filtered DEG is then piped directly to the storage tank.

DEG Pumps and Piping

The DEG is drawn from the storage tank by three steam engine driven 1½ in. x 2 in. vertical triplex pumps, operating in parallel. It is pumped through three parallel banks of atmospheric cooling sections where it is cooled to approximately the temperature of the gas being treated, and then enters the contactors through indicating flow meters.

There are two manifolds in the DEG piping, one at the pump discharge and one in front of the contactors, which make the DEG system completely flexible. Normally each pump puts liquid directly through one bank of coils and into one contactor with the volume being determined by the speed of the pump. However, in case any pump, bank of coils, or contactor must be out of service the manifold system allows any of the pumps to put DEG through any of the coils into any of the contactors. In case the DEG streams have to be combined, as in the case of two pumps serving three contactors, the liquid is separated in the manifold at the contactors and the flow equalized into the vessels by means of the indicating flow meters. Since the volume of liquid handled by any of the pumps can be varied as much as 50% above or below normal flow by changing the pump speed, it is unnecessary to have additional stand-by pumps to take care of emergency shutdowns for repairs, etc., as it would be quite unlikely that more than one pump would be out of service at any one time.

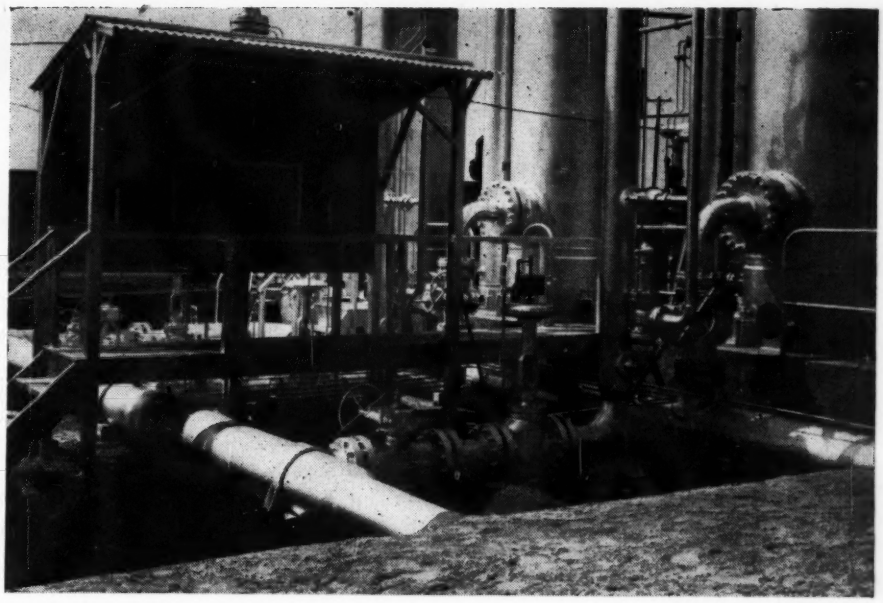


FIG. 4. Gas piping and control house at contractors.

Steam for heating and for operating the pumps, engines, etc., is generated in a 1050 sq. ft. HRT boiler, operating at 150 psig and giving a resultant steam temperature of approximately 366° F. The boiler fuel is automatically controlled from the boiler pressure by means of a pilot operated motor valve set in the fuel line. An additional motor valve set in the fuel line serves as a safety valve and automatically cuts off the fuel in case of too high or too low water level in the boiler. The pilot of the safety shut-off valve is activated by steam pressure from a float valve in the boiler water column. At the same time the safety shut-off is closed a whistle is blown to warn the operator.

The boiler feed water pump is a steam driven horizontal duplex pump. The speed of the pump is controlled by a pilot operated motor valve in the steam feed line, activated by a liquid level controller on the boiler. All condensate from the main steam line, headers, pre-heaters, and reheater is returned to the boiler feed water tank. The only waste steam is that exhausted from the engines driving the DEG pumps. This steam is wasted because of the fact that it might contain some slight oil content from the engines, and the quantity is so small that it was not considered worthwhile to install equipment which would guarantee positive separation.

Condensate Removal

All condensate removed from the gas by traps or separators or by contact with the DEG is piped to a gasoline water separator. Here the water is drawn off through a motor valve operated by an interface liquid level controller, and is piped into a waste water system. The gasoline is trapped off and put into storage.

All pressure vessels in the plant are designed and built in accordance with the API—ASME code for unfired pressure vessels. All piping is designed in accordance with ASA Code for Pressure Piping, listed as ASA B31.1-1942, the gas piping being designed under Division 1 of "Gas and Air Piping Systems".

All controls, automatic devices, safety equipment, etc., are either pressure or temperature operated. This makes the plant completely independent of any electrical service, except for lighting purposes. This is advantageous in that the demand for the plant is in the wintertime when due to storms, etc. there is more likelihood of electrical failures in the rural systems.

THE MASS SPECTROMETER

A Tool for Chemical Research and Industry

By H. W. WASHBURN, H. F. WILEY, S. M. ROCK, and C. E. BERRY

Consolidated Engineering Corporation, Pasadena, California

THE mass spectrometer has in the past two years graduated from a piece of laboratory apparatus to an industrial instrument. It is at the present time being used for refinery control as well as for special analytical problems encountered in oil refinery operation. In addition, it is being employed in experimental laboratories engaged in process development and other chemical research.

The mass spectrometer and associated apparatus are shown in Fig. 1. Either gas or liquid samples can be analyzed. If the sample is normally a gas, it is first introduced into the metering volume where its pressure is measured. It is then expanded into the inlet sample bottle.

If the sample is normally a liquid, a known amount of the liquid is first sealed in a small glass ampoule. This ampoule is waxed into the metal break-off compartment where it is broken off under vacuum and allowed to expand into the inlet sample bottle. The pressure in the inlet sample bottle is sufficiently low so that the normally liquid sample is in vapor phase and hence for the remainder of its flow need not be distinguished from the gas sample.

The sample is allowed to flow through the ionization chamber by opening the stopcock immediately ahead of the orifice. The pumping system and orifice are designed to maintain a constant flow of the sample through the ionization chamber.

When in the ionization chamber, the gas is subjected to electron bombardment which converts some of the neutral molecules into positive ions. These ions are acted on by electric and magnetic fields so as to form a fan of ion beams, each beam containing ions of one mass only.

By gradually varying the electric or magnetic fields this fan of ion beams is forced to sweep past the exit slit E. In this manner the ion beams are allowed to impinge successively on the target T. The current imparted to the target is amplified and fed into a galvanometer which deflects through an angle proportional to the abundance of the ions in each beam.

The galvanometer deflections are recorded by passing a sensitized photographic paper at a uniform rate past the galvanometer light beam. The resulting record is called a mass spectrum.

From the mass spectrum of a mixture and a knowledge of the mass spectra of its components, the composition of the mixture can be determined.

Synthesis and Analysis of Mixture Mass Spectra

The method in which the mass spectra of the separate components of the mixture superimpose to form the mass spectrum of the mixture is illustrated in Fig. 2. The spectra for the mixture components are obtained by introducing a standard pressure of each of these pure substances separately into the mass spectrometer. The abscissae on these mass spectra at which peaks occur represent the masses of the ions, and the ordinates or peak heights represent the abundances of the ions. From these spectra of the pure components, the mass spectrum which would be obtained upon running a given mixture can be predetermined or synthesized in the manner described below.

The mixture chosen for illustration corresponds to a sample of depropanizer bottoms and contains C_3 through C_5 paraffins and olefins. The mixture contains 4% normal pentane, and so the contribution of normal pentane to each of the peaks in the mixture spectrum is 4% of the corresponding peaks in the normal pentane spectrum. These contributions are indicated in the mixture spectrum by the dotted portion of each mixture peak. Similarly, since the mixture under consideration contains 4% isopentane, 4% of each of the peaks in the isopentane spectrum will be the contribution of the isopentane to the mixture spectrum. These contributions are shown by the vertically striped por-

THE MASS SPECTROMETER, a relatively new tool of the technical analyst, is finding increasing usefulness in petroleum research and refinery operation and control. Its greatest development and present usefulness is in the analysis of hydrocarbon gases and the lighter liquids; it requires only very small samples, but can analyze them to considerable accuracy even if complex in composition; and relatively minute quantities of "impurities" can be detected with precision. It would seem that these capabilities would be of particular interest to technologists of the Gas Industry, not only because of the technique already developed in the hydrocarbon field, but also in the light of its potentialities for analysis of other types of compounds, and its general application as both a research and production instrument.

H. W. Washburn

The present study is an abstract of an article, "Mass Spectrometry," published in the February, 1945 (Analytical Edition) of INDUSTRIAL AND ENGINEERING CHEMISTRY (p. 74 et. seq.). Permission to reproduce the figures and text has been granted by the copyright owners, the American Chemical Society.

In the past few years, Dr. Washburn's entire efforts have been devoted to the development of the mass spectrometer and its associated techniques for analysis of gas and liquid hydrocarbon mixtures.

His writings include articles on electrical breakdown phenomena, seismic prospecting, and mass spectrometry which have appeared in Geophysics, A. P. S., and A. C. S. publications.

Harold Washburn studied mechanical and electrical engineering at the University of California at Berkeley receiving his Bachelor's degree in 1924. He continued his study as a member of the electrical engineering laboratory teaching staff at the Massachusetts Institute of Technology, receiving his Master's degree in 1927. After a year as a student engineer with General Eelectric Co., he returned to the University of California as an instructor in electrical engineering. Concurrent with his teaching he carried on research in the field of electrical breakdown of liquid dielectrics, and in 1932 receved his Doctor's degree.

In 1937 he became vice president of Consolidated Engineering Corp., serving as director of research. His first work, in the field of instruments and techniques connected with petroleum exploration, was soon expanded into the field of vibration and mass spectroscopy.

tions of the mixture peaks. In a similar manner, the contributions of 10% pentenes, 20% normal butane, 20% isobutane, 40% butenes, 1% propane, and 1% propene are indicated by cross-hatching of different types as shown in the key. The mixture spectrum is the linear superposition of the spectra of the pure components.

The analysis of a mixture from the mixture mass spectrum and a knowledge of the mass spectra of the pure components in the mixture is the unraveling of the mixture mass spectrum into its component parts or the reverse of the synthesis described above. The data are therefore the same as shown in Fig. 2 with the exception, of course that the peaks in the mixture spectrum would not be subdivided.

Since the above superposition is linear, the analysis for the separate components in the mixture can always be obtained by merely solving a set of simulanteous linear equations, the number of equations being equal to the number of components in the mixture. The data required to set up the simultaneous equations for an analysis of an N-component mixture are the heights of N mixture peaks and the heights of the peaks at these same masses in the calibration spectra. It is, however, found in practice that it is seldom necessary to solve a large number of simultaneous equations, since in many practical cases the characteristics of the mass spectra are such that short cut methods can be employed.

Fig. 3 shows the automatic record of the mass spectrum of a depropanizer overhead. The recording of this complete record requires about three minutes. The total time from receiving the sample to obtaining the results in this case is 30 minutes for a control type of analysis and 40 minutes for a complete analysis.

Accuracy of the Mass Spectrometer Method of Analysis.

In order to determine accurately the errors which may be expected in a particular analysis, it is necessary to run a large number of synthetic samples. Fortunately, we have available 32 analyses made on one particular synthetic mixture which is the acceptance test mixture for the Consolidated mass spectrometer. The errors observed are a fair representation of the errors normally encountered in the analysis of this type of mixture. The analyses were made on six different mass spectrometers.

The results of these analyses are shown in Table 1. The first column shows the components of the mixture. The second column shows the approximate composition of the mix-

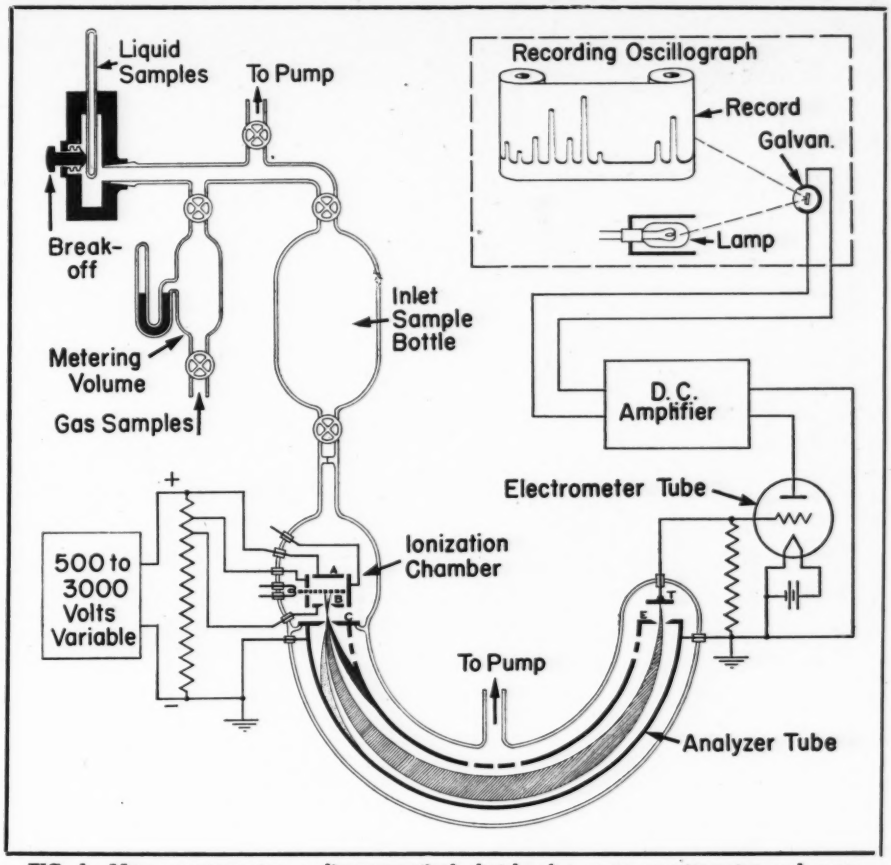


FIG. 1. Mass spectrometer, a diagrammatical sketch of a mass spectrometer and associated apparatus as used for the analysis of gas and liquid mixtures.

TABLE 1. ERRORS IN MASS SPECTROMETER ANALYSES

Components	*Composition Mol %*	*No. of Determinations*	*Average Error Mol %*	*90% of Errors Less Than*
Methane	15			
Ethane	20			
Propane	20	160	0.2	0.4
Isobutane	10			
n-Butane	8			
Propylene	10	32	0.2	0.5
Isobutene	7	32	0.4	0.6
Butene - 1	5	64	0.7	1.1
Butene - 2	5			
Butenes	17	32	0.3	0.7

TABLE 2. PARAFFIN-OLEFIN MIXTURES CONTAINING SUBSTANTIAL AMOUNTS OF C_5's

These mixtures illustrate the analysis of light hydrocarbon mixtures, containing a large number of components.

	C_1=C_5			C_3=C_5			C_3=C_5		
	Synthetic	*MS*	*Diff.*	*Synthetic*	*MS*	*Diff.*	*Synthetic*	*MS*	*Diff.*
H_2	3.0	3.2	+.2						
Methane	10.8	10.3	—.5						
Ethylene	6.0	5.9	—.1						
Ethane	6.0	5.8	—.2						
Propene	11.1	11.1	.0	12.5	13.1	+.6	13.2	13.4	+.2
Propane	19.2	19.5	+.3	24.8	24.9	+.1	25.9	26.4	+.5
Isobutane	20.1	20.0	—.1	25.0	25.0	.0	25.6	25.6	.0
Isobutene	2.8	1.6	—1.2	3.8	3.6	—.2	4.1	3.0	—1.1
N-Butene	2.9	4.1	+1.2	5.4	5.3	—.1	5.4	6.5	+1.1
(Butene-1)	(1.5)	(2.4)	(+.9)	(3.0)	(2.6)	(—.4)	(3.2)	(3.3)	(+.1)
(Butene-2)	(1.4)	(1.7)	(+.3)	(2.4)	(2.7)	(+.3)	(2.2)	(3.2)	(+1.0)
N-Butane	5.0	5.2	+.2	7.5	7.7	+.2	7.6	7.8	+.2
Isopentane	10.1	10.2	+.1	6.4	6.4	.0	6.7	6.5	—.2
Pentenes	3.0	3.1	+.1	8.2	7.5	—.7	4.9	4.6	—.3
N-Pentane				6.4	6.5	+.1	6.6	6.2	—.4

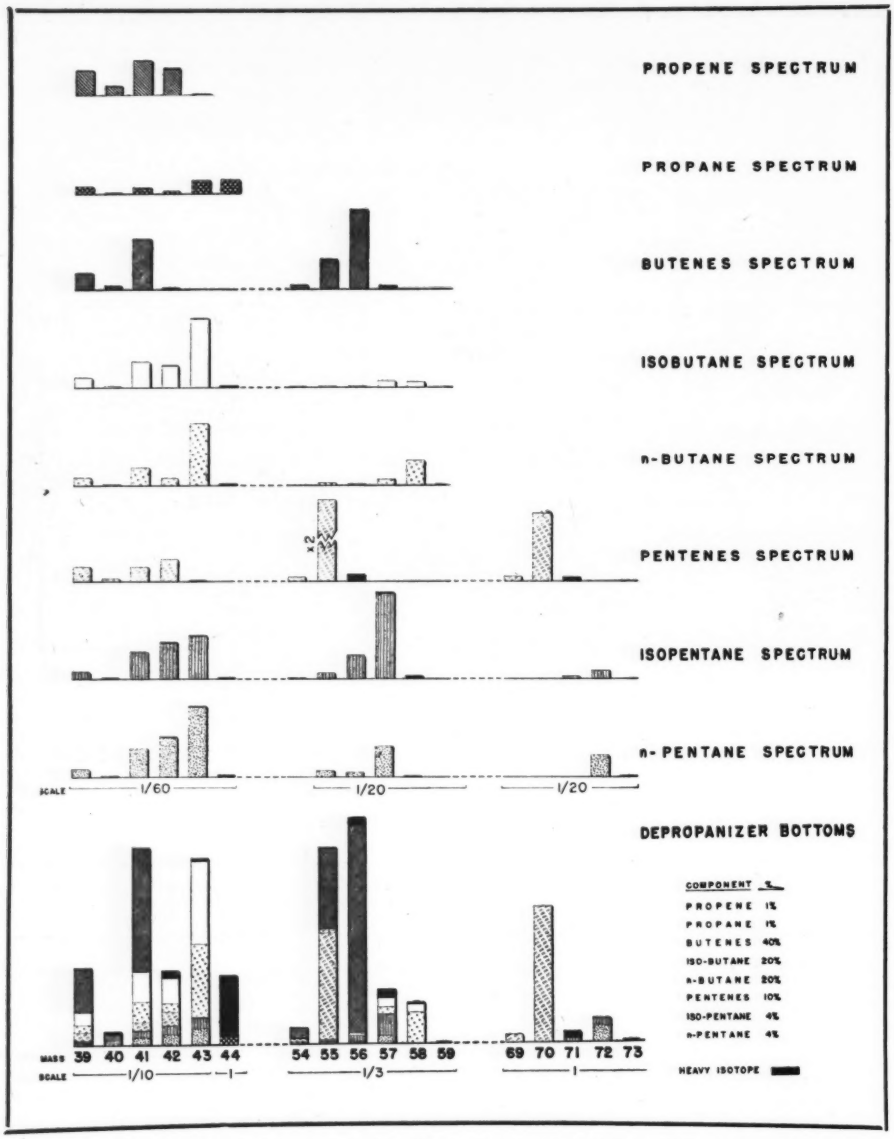


FIG. 2. Superposition of mass spectra. The mass spectrum of each component of the Depropanizer Bottoms mixture is as shown. Then, the superposition of the component spectra to form the mixture spectrum is illustrated. The analysis consists in determining the separate spectra which are superposed in the mixture spectrum.

TABLE 3. OPERATION OF THE MASS SPECTROMETER

1. The sample is introduced into the gas-handling system, employing techniques commonly used in gas-handling apparatus. After the stopcock between the inlet sample bottle and the mass spectrometer has been opened (allowing the sample to start flowing through the mass spectrometer), about one minute is allowed for equilibrium conditions to take place. During this short period of time, the operator checks the various voltages supplied to the mass spectrometer.
2. In particular, he checks the value of the positive ion accelerating voltage to make certain that he will start at the lowest mass which he desires to record.
3. At the end of this one minute interval he pushes the mass marker re-set button, turns on the camera switch, and throws the sweep switch to the sweep position. The mass spectrum is then recorded automatically and the operator merely checks once or twice on the instruments during the run and corrects if necessary any slight variation that might occur. The recording of a record takes from 5 to 10 minutes, depending upon the range of masses which it is desired to record. If the operator wishes, he may keep a rough check upon the progress of the record by watching a meter which is in series with the galvanometers.
4. As soon as the recording is completed, the photographic paper is removed from the camera and taken in a light tight sleeve to the dark room. The developing, fixing and washing process requires less than five minutes, which is approximately the time required for pumping out the sample so that the next sample can be introduced. The majority of the water is removed from the record with a sponge and the record is ready for analysis.

ture. The fourth column shows the average error in mol percent. In order to give an idea of the spread of the errors, a fifth column is given which shows an outside error within which 90% of the results were included.

One important result of the compilation of these errors is that from them it has been possible to obtain some empirical coefficients which permit the prediction of accuracy on mixtures which have not as yet been run, but for which the mass spectra of the various components have been determined.

Types of Mixtures and Their Analysis by the Mass Spectrometer

A good deal of work has been done in analyzing synthetic samples of different types with the mass spectrometer. The field is, however, quite broad and the method relatively new, so that it is difficult at this time to generalize to any extent on the types of mixtures best suited to analysis by this new method. In the following discussion, general statements have been made wherever possible, but for the most part it has been necessary to discuss specific examples.

The determination of small amounts of a particular substance (impurity) in a relatively pure sample or in a mixture is in many cases accomplished with more accuracy by the mass spectrometer method than is possible with other methods: for example, the determination of small amounts of diethylbenzene in ethylbenzene, pentenes in isoprene, pentenes or butenes in butadiene. In such cases the minimum amount of impurity that can be determined is approximately .01% for automatic recording. If manual recording is employed this can be reduced to less than .001%. Another case of particular interest to petroleum refiners is the determination of small amounts of pentenes and pentanes in a C_4 cut. In this case quantities of pentenes as small as .02% and of pentanes as small as .2% can be determined. For manual recording these values are less than .001 and .005% respectively.

In general, where the impurity is of higher mass than the other components of a mixture, a very small amount of this impurity can be detected and measured. Frequently even though the impurity is not of heavier mass than other components of the mixture, some of its main peaks will occur at mass numbers to which the other components of the mixture do not contribute to an appreciable extent, if at all. For example, as small an amount as .2% of propane in a C_4 mixture can be detected.

The analysis of a mixture contain-

ing a large number of components is illustrated by the analyses shown in Table 2. The first mixture shown contains hydrogen and C_1 through C_5 paraffins and olefins. It was prepared by mixing together very carefully metered volumes of known and relatively pure hydro-carbons. The first column shows the mol percent of each constituent in the mixture as determined during its synthesis. The second column shows the results obtained by the mass spectrometer analysis of the mixture. The third column shows the differences between the synthesis and the mass spectrometer determinations. These differences compare very favorably with the errors shown in Table 1 for C_1 through C_4 analyses. Of course, a great deal cannot be said regarding the accuracy of analyzing a particular type of mixture from one analysis. Therefore, the method of predicting the accuracy which was previously mentioned was applied to this particular mixture, and the above comparison substantiated.

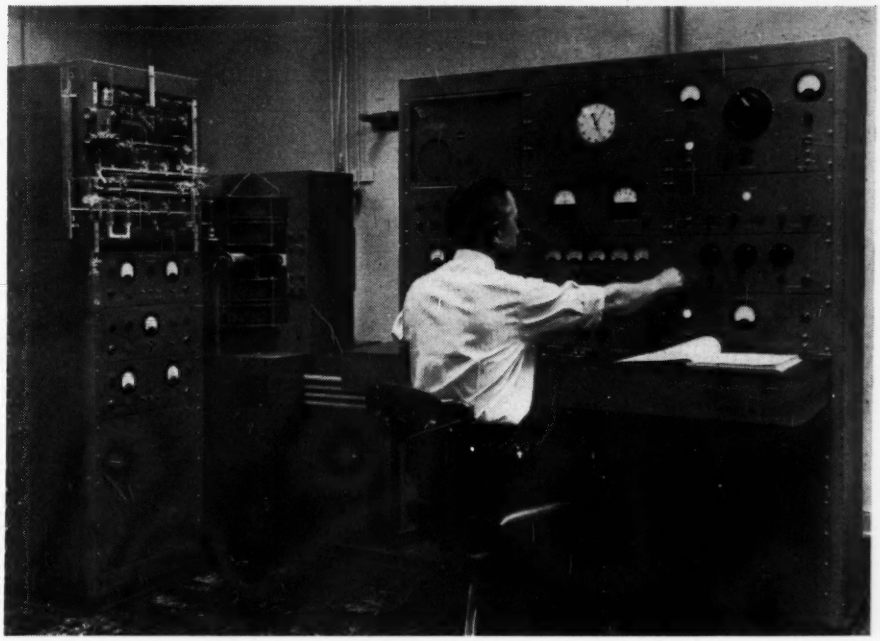


FIG. 4. Typical installation of consolidated mass spectrometer.

The Consolidated Instrument

Fig. 4 shows a typical installation of the Consolidated mass spectrometer. In the center background is the large electromagnet which houses the mass spectrometer proper. To the left of this magnet is the gas-inlet cabinet, housing the gas handling equipment through which the samples are introduced into the mass spectrometer. The panels directly below the glassware control the vacuum pumps used in the gas-handling apparatus and the mass spectrometer evacuation pumps. The meters on these panels indicate the pressures in various parts of the gas-handling system and in the mass spectrometer.

On the right is the main control cabinet containing the power supplies which furnish extremely closely regulated voltages to the magnet and to the mass spectrometer. In addition, this cabinet houses the d.c. amplifier and automatic recording oscillograph which make permanent photographic records of the mass spectra.

It may be seen from Fig. 4 that there are a considerable number of switches and dials on the various panels. However, only a few of these switches and dials are used during the normal routine operation of running samples. The majority of the dials and switches are used only when starting up or shutting down the instrument, or for calibrations of amplifier and galvanometer sensitivity. These latter calibrations are normally taken as a check once a day. The starting up and shutting down of the instrument is partially carried out once a week and a complete shutdown is normally necessary only once in several months. The operator, therefore uses the majority of the controls only at infrequent intervals. The routine operation of the mass spectrometer has worked out in practice to be a relatively simple procedure. This procedure is generally as shown in Table 3.

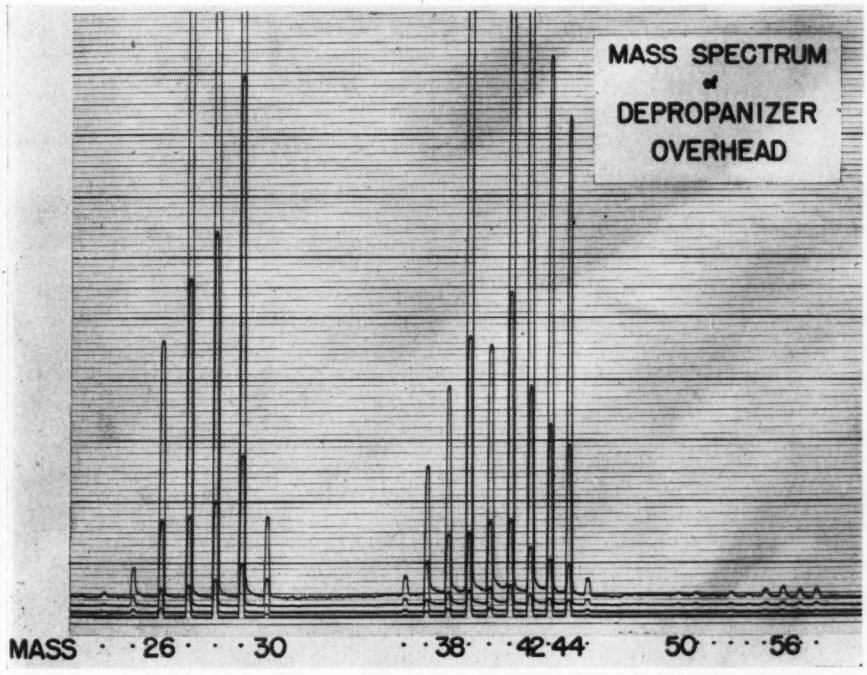
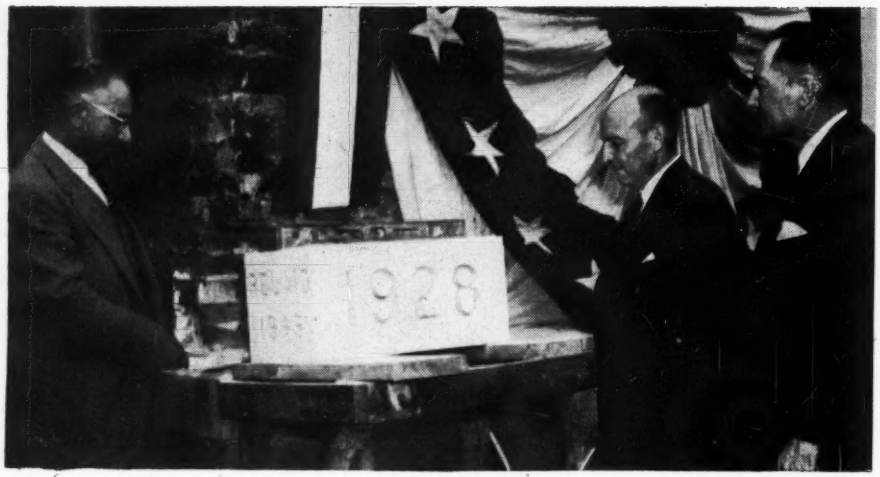


FIG. 3. Automatic record of depropanizer overhead. Four galvanometers record peaks simultaneously at four sensitivity levels to insure accurate measurement over a large range of magnitudes.

Conclusion

This paper has dealt for the most part with applications to the petroleum refinery. The data presented show that the mass spectrometer has proved to be of definite value in this field as a relatively speedy, accurate, analytical tool. The method described is, however, a general one and is at the present time just beginning to be applied to other fields in the chemical industry. It is our aim to continue development of the method for application in all fields where it shows promise of aiding in the solution of important technical problems.



President Robinson Laying Cornerstone With George E. Whitwell, Laboratories Managing Committee Chairman, and R. M. Conner, Director, Looking On.

Laboratories' Cornerstone Relaid

THE American Gas Association Testing Laboratories in Cleveland completely reoccupied their former quarters on April 12, thus again centering all Cleveland operations in one place after having maintained separate temporary offices for six months after the Cleveland gas fire.

J. French Robinson, president of the American Gas Association, relaid the Laboratories' cornerstone just 17 years after the building had been erected under the chairmanship of a former East Ohio Gas Co. president, R. W. Gallagher, now chairman of the board of the Standard Oil Company of New Jersey. The Laboratories were originally established in 1925. Gallagher was unable to attend the ceremony.

Among the some 200 guests attending was Robert B. Harper, vice president, The Peoples Gas Light and Coke Co. of Chicago, also a member of the first Laboratories' Managing Committee and for many years chairman of the Approval Requirements Committee. Harper was called on for a few remarks by George E. Whitwell, present chairman and vice-president in charge of sales of the Philadelphia Electric Co., who acted as master of ceremonies.

Members of the Laboratories' Managing Committee meeting with Whitwell prior to the ceremony for an inspection of the building were Charles E. Bennett, president, The Manufacturers Light and Heat Co., Pittsburgh; N. B. Bertolette, president, The Hartford Gas Co.; C. H. Waring, vice-president and general manager, The Wyandotte County Gas Co., Kansas City; and Laboratories Director R. M. Conner. A. F. Bridge, vice-president and general manager, Southern Counties Gas Co., Los Angeles, was unable to be present.

Executives of the American Gas Association attending besides President Robinson included E. J. Boothby, first vice-president; Major Alexander Forward, managing director; and George A. McDonald, director of Publicity. Lyle C. Harvey, president, The Association of Gas Appliance and Equipment Manufacturers represented his organization. The American Society of Heating and Ventilating Engineers was represented by Professor G. L. Tuve, chairman of its Research Committee.

Of the Laboratories staff of 27 at the time the building was erected in 1928, half are still active in the gas industry. Five, R. M. Conner, F. E. Vandaveer, K. H. Flint, F. A. Allen and F. R. Wright, are still members of the staff. Nine are employed either with utilities or manufacturers.

Today, research endeavors have been stepped up until they are three times the level of a few years ago. It is significant that in the last 10 years more improvement in gas-burning equipment has resulted than had taken place in the previous 40 years. More than 95% of all gas equipment now sold bears the Laboratories Approval Seal.

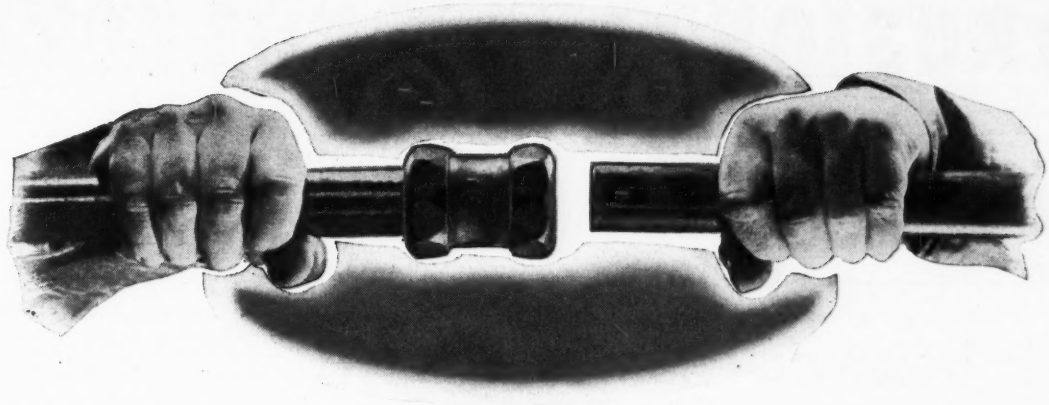
Development of single point automatic flash tube ignition for oven and broiler burners, formulation of basic gas burner design techniques, and the current investigation of kitchen ventilation represent some of the highlights of recent domestic gas research endeavors. Studies in immersion tube heating, typical of industrial research, further advancements in the mixing of gases for better and more effective utilization, and fundamental air conditioning studies are examples of what research has contributed to the welfare of the industry.

During the war, many regular functions of the Laboratories have been curtailed. However, a total of 14 separate devices were developed by the laboratories for the country's armed forces.

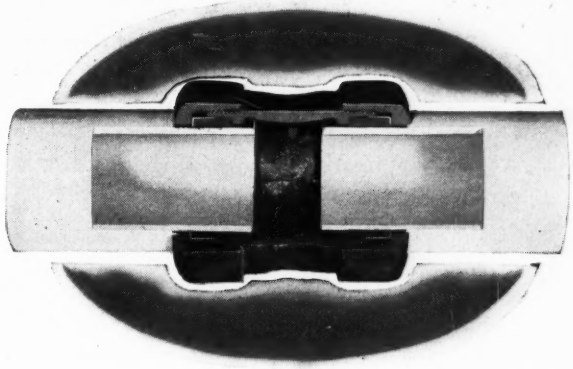
Experimental and research activities resulted in the development of a number of devices for the control, indication and detection of various gases as used for war purposes, particularly oxygen and helium. These include an automatic oxygen regulator for transport planes, a hospital plane regulator for use in transporting wounded, helium retention and purity instruments, and a number of regulators for flow control under special circumstances.

The success attained by the Laboratories in the conduct of their first large contract for continuous flow automatic oxygen regulators for transport planes is proven by their award by the Army Air Forces a few months ago of a second like contract covering a newer improved design. These regulators are now in use wherever mountains or weather conditions require flight at high altitudes.

Section of Remodeled General Offices



No accurate pipe fitting necessary



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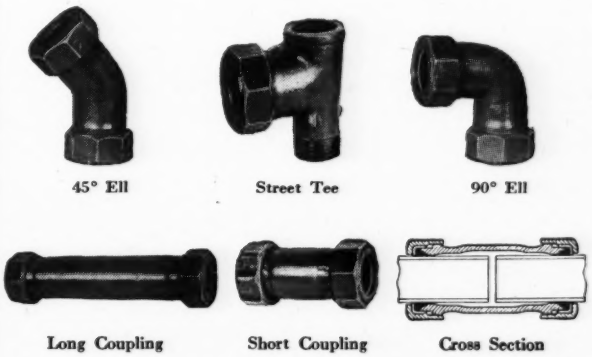


DRESSER FITTINGS for Small Piping

CORROSION AND PROTECTION

Of Buried Metallic Structures

Compiled and Abstracted by GUY CORFIELD, Technical Editor, GAS

Cathodic Protection--What Does It Cost?

By STANLEY A. WRIGHT
Pacific Gas and Electric Co., San Francisco, Calif.

THIS paper is a brief discussion and summary of operating costs for five years of eight Cathodic Corrosion Eliminators (a) (Rexselen).

In 1929 and 1930, when the major portion of the Pacific Gas and Electric Co. system was converted to natural gas, it was necessary to lay approximately 45 miles of 12-in and 8-in HP gas main to serve the central coast portion of the system. The general layout of this line is shown on attached sketch.

The great variety of soil conditions and the topography traversed by this line made electrolytic and soil corrosion trouble a serious problem for the future. The line makes submarine crossings under one river and five streams that are wet the year round. It crosses two ranges of hills with maximum elevations of 1140 ft. and 450 ft. The last mile of line is practically at sea level and portions of this main are actually below high tide level which means that the pipe is buried in wet soil saturated with salt throughout the year. Also, several miles of this line are adjacent to fields that are heavily irrigated during the dry season.

It will be immediately recognized that these conditions are very conducive to rapid pipeline deterioration from both electrolytic and soil corrosion.

The pipe was all single wrapped which fact offered a good opportunity for the application of electrical mitigation methods if it should prove economically feasible. Surveys were made to determine the capacities and locations of possible rectifying units. These surveys covered a period of about three years and consisted of soil samples to determine soil corrosivity, pipeline currents, current discharge and pick-up from and to the pipe, and finally the use of corrosion coupons (b) which gave an indication of actual corrosive activity along the line over a period of time.

From these surveys, eight Cathodic Corrosion Eliminators were located along the line.

As is indicated on Table 1, which gives the operating data and costs over a five-year period, only 28 miles of the 45 miles of line is protected electrically. In general, the remainder of the line is subjected to such mild

OPERATING DATA AND ANNUAL COSTS FOR EIGHT CORROSION ELIMINATORS (Rexselen)

1 *Unit No.*	2 *Unit Rating Amps.*	3 *Miles Protected*	4 *Pipe Size*	5 *Power Consumed Yearly Ave. KWH*	6 *Power Cost Yearly Ave.* $	7 *Power Cost Per KWH* $	8 *Output Yearly Ave. KVAH*	9 *Output Cost Per KVAH* $	10 *Efficiency KVAH/KWH* %	11 *Investment* $	12 *Depreciation* $	13 *Interest on Investment* $	14 *Taxes* $	15 *Operating Costs* $	16 *Maintenance* $	17 *Annual Costs Total* $
1	15	2.4	12"	540	31.70	.059	294	.108	54	991	42.58	59.46	19.82	40.00	60.00	253.56
2	15	2.5	12"	691	37.50	.054	406	.093	59	964	41.42	57.84	19.28	40.00	60.00	256.04
3	15	5.0	12"	1,431	62.80	.044	714	.089	50	952	40.91	57.12	19.04	40.00	60.00	279.87
5	15	2.0	8"	983	38.20	.039	475	.081	48	816	35.06	48.96	16.32	40.00	60.00	238.54
5A	15	6.0	8"	858	35.42	.041	410	.086	48	824	35.41	49.44	16.48	40.00	60.00	236.75
6	15	1.7	8"	1,242	47.87	.039	678	.071	55	760	32.66	45.60	15.20	40.00	60.00	241.33
7	15	1.5	8"	833	31.08	.037	389	.080	47	850	36.52	51.00	17.00	40.00	60.00	235.60
4	20	5.4	12")													
		1.6	8")	1,351	47.90	.037	694	.069	51	926	39.79	55.56	18.52	40.00	60.00	261.77
TOTAL	8	28.1		7,929	332.47		4,060			7,083	304.35	424.98	141.66	320.00	480.00	2,003.46
AVE.				991	41.59	.044	508	.085	52	889	38.04	53.13	17.71			

Explanation of Data

Column 4: This pipe is all single wrapped with asphaltic wrapping material.

Column 5: This A.C. power consumption is the average kilowatt hours consumed annually over a five year period.

Column 6: This power cost is the average annual cost over a five year period using the regularly established rate applicable to this type of use.

Column 8: The out-put of these units is the average over the five year period of the monthly reading of the D.C. indicating voltmeter and ammeter multiplied by 8760 hours in the year.

Column 10: The efficiency of these units is the out-put (kilovolt ampere hours divided by the in-put—kilowatt hours). The average annual values were used.

Column 11: The investment is the total installed cost of the complete Cathodic Corrosion Eliminator.

Column 12: The depreciation as represented is that based on an assumed life of the entire installation as being 15 years.

Column 13: The interest on the investment was taken as the usual 6%.

Column 14: Taxes are represented as 2% of the investment.

Columns 15 and 16: No accurate record of the operating and maintenance costs is available. The amounts used are from experience believed to represent a fair estimate of the true charges.

Column 17: The total annual cost for each unit is made up of the charges in column 6, 12, 13. 14, 15 and 16.

soil and electrolytic conditions that cathodic protection was considered uneconomical as this portion of the pipe has an estimated life of 50 years or more. $2500 was spent on these sections of the line to apply a protective coating of 1 in. of asphalt around the main in sections varying from 50 ft. of 250 ft. where the pipe crossed under streams or through wet soil conditions.

With this expenditure of $2500, together with the $7083 that the eight cathodic corrosion eliminators cost installed, or $9583, we believe that the maintenance and repair on this 45 miles of HP main due to soil and electrolytic corrosion has been reduced to a negligible figure for the life of the pipeline which we estimate will be over 50 years. This 45 mile pipeline and accessories represents a capital investment of $650,000 and the replacement cost of that 28 miles which is cathodically protected is conservatively estimated at $300,000. The additional investment of $7083, or slightly over 2% of the pipeline investment to extend the life of the pipe from 2 to over 10 times its original life expectancy was manifestly a good investment.

Of course, the original cost of the protective units is but part of the answer. What does it cost to operate the units or what are the annual charges? The data in Table 1, gives this information in detail for each of the eight eliminators. This tabulation was made to assist in analyzing the record of each unit separately.

Figures Clarified

A few comments will clarify the figures in the data columns. The power costs are the actual watthour meter readings computed at the regularly established rate for this class of service. The difference in cost per KWH for the first three units and the other five is accounted for by the fact that the first three units are in the territory of neighboring utility and the power used is billed on a lighting schedule. The other five units are on our own lines and are billed on a power schedule.

The kilowatt ampere hours in column 8 are of necessity computed from the monthly readings of the indicating instruments in the unit as there are no recording instruments in the D.C. or out-put side of the circuit. These figures give a fairly accurate picture, however, as the D.C. voltage and ampere values stay within a very close range from day to day.

As indicated, the efficiency of the units given is the volt ampere out-put divided by the watt in-put. The reason for this is that we are not interested in the power out-put as it is D.C. amperes that accomplish the protective work.

For simplicity and because we do not know exactly what future pilot pipe trouble we may have, the conservative figure of 15 years has been used for depreciation calculations in column 12. These units are all equipped with cast iron pilot pipes. Because of the tendency of cast iron to change to graphitic iron (c), under these conditions, we may have to replace some or possibly all of these pilot pipes. Likewise, there is not much information as to the probable life of the Rexselen elements. However, in over five years of service, it has not been necessary to replace or in anyway service the elements in any of the eight units. Accepting the doubtful life of the cast iron pilots and unproven longevity of the selenium elements, 15 years is considered a conservative period for amortization of the investment.

The operating and maintenance charges in columns 15 and 16 are considered liberal, as in the case of most of our units, the monthly D.C. readings are made by the meter reader. Reading the watthour meter for billing purposes and cleaning and painting the rectifier cabinet once a year constitutes the major part of the necessary operation and maintenance.

Summarizing, it has cost an average of $2003.46 per year over the past five years to operate these eight cathodic corrosion eliminators that protect 28.1 miles of HP gas main. This main represents an investment of over $300,000 so the annual costs are less than 1% of the original investment in pipeline.

REFERENCES

(a) See "Comparative Costs of Cathodic Corrosion Protection Equipment" by W. R. Schneider, P.C.G.A. Proceedings 1939.

(b) See "Corrosion Coupons and Pipe Life Predictions" by W. R. Schneider, P.C.G.A. Proceedings 1941.

(c) See "Electrical Connections to Graphitic Iron Pilot Pipes or Ground Electrodes" by Merritt H. Brady, P.C.G.A. Proceedings 1939.

Protective Mats to Prevent Swollen Stream Washouts

Designed by B. G. Barnes, district drilling and production superintendent, and his crew in the Tinsley (Miss.) field of United Gas Pipe Line Co.'s Jackson district, this device was first described in the company's magazine, "United Gas Log."

Excessive spring rains have caused washouts and cave-ins in many locations of the United Gas Pipe Line system, creating an unusual amount of maintenance and repair.

To combat this condition a protective mat was built along the bank of O'Neil creek in the Tinsley field. The mat was made of junked rods, 2-in. pipe and sandbags.

Installed in sections, the mat is secured in place by spot welding the rods of adjoining sections. Wire ties were used to hold rods in position at all intermediate points within the individual sections.

Construction of the mat was, of necessity, an on-the-ground job at the point of installation. Rods used to interlace the frame work of 2-in. pipe were worn out and junked sucker rods previously used in pumping wells of the area.

It was installed at low water stage, with sand bags and brush employed to fill in between mat and caving creek bank. Growing vegetation, penetrating the interlaced rods, will assist in holding the entire assembly in place and offer added protection against future washouts.

View of protective mat in place. Willow sprouts will grow through mesh holes. J. R. Rutherford, photographer.

SAFE PRACTICE
As Related to the Gas Leak Survey

By D. E. HERRINGSHAW

General Supervisor of Gas Operations, Engineering and Construction
Consumers Power Company, Jackson, Michigan

THE subject, "Safe Practices and Its Relation to the Gas Leak Survey", touches upon a fertile field in which to practice conservation through the application of safe practices. Losses occasioned through leaking gas account for a sizable portion of industry's total gas production. Much of this loss is avoidable.

To increase the effectiveness of leak detection we must employ more modern equipment and more rapid survey methods. The old method of bar testing over each joint of pipe, while still useful in some instances, is outmoded to a large extent because of the great amount of time required in its accomplishment. Faster means, making possible more frequent surveys, are necessary.

The number of leaks occurring between surveys and causing damage before they are discovered and reported, can only be curtailed by increasing the frequency of the survey. That method or combination of methods which will give us the most complete coverage in the least time is, therefore, the most valuable.

Leak Detection Methods

We have at our disposal many different methods of leak detection, all of which, with the exception of the odorization factor, are applicable to both manufactured and natural gas. Without attempting to list the various methods in the order of their importance, some of the most useful are as follows:

1—Bar testing
2—Vegetative surveys
3—Inspection of entrances to underground structures
4—Inspection of customers' premises
5—Patrolling
6—Off-load flow records
7—Periodic over-odorization
8—Reports from associated utilities, police and fire departments
9—Reports from employees, customers and tenants in general adjacent to gas lines.

Each method has its particular advantages under certain circumstances, and if some study be given to the use of each, the maximum of protection will be secured.

1. *The typical bar test method*, that of drilling a test hole down to the top of each joint of pipe and using a conductor pipe to smell for, or a combustible gas detector to test for escaping gas has been used by all gas companies for years, and is thorough but slow. It is best utilized in critical sections of the system where, due to congested areas, high pressures, old mains, or other extreme circumstances, particularly close surveillance is advisable. Some of the critical sections regarded as calling for frequent inspections by this method are areas embracing schoolhouses, hospitals, churches, greenhouses, public or private buildings housing large numbers of workers, and transmission or other high pressure lines laid in congested areas.

2. *The vegetative survey*, most rapid of all methods, has proved to be equally as effective in natural gas areas as in manufactured gas areas. This type of survey may be utilized in season throughout the system wherever vegetation exists over or near the gas lines. This method of leak detection is low in cost and especially suitable in less critical areas where one survey per year may be adequate.

3. *Inspections, underground structures*: Inspection of entrances to underground structures is of particular value in the business section of cities where little or no vegetation exists, where it is difficult to conduct bar testing, and where the greatest concentration of underground structures is present to act as conductors for leaking gas. Full use should be made of the opportunity to inspect manholes, vaults, conduit terminals, sewer and drain openings, and any other entrances to underground structures of associate utilities that might afford a conveyance for gas. As mentioned, this type of survey is particularly suitable to the business sections of cities, which are considered critical areas for leak survey purposes, and should be conducted frequently. In natural gas areas, a combustible gas detector should be used in making the tests for presence of gas.

4. *Inspections, customers' premises*: Such inspections at regular intervals is desirable in the case of commercial customers. Tests made at or near the service entrance, by smell or instrument, depending on the type of gas, reveal a number of leaks, and in addition future trouble is forestalled by these inspections where they disclose merchandise and equipment piled on service pipe or meter manifold to a dangerous extent, and reveal corroded service entrances which would shortly give trouble.

5. *Patrolling*: The patrolling of gas lines is a rapid method of leak detection particularly suited to long transmission lines. By heavily odorizing the gas transmitted, many small leaks will be detected in addition to those heard or seen. A little experience in observing condition of vegetation, such as crops, trees, shrubs and grass, may assist in finding other leaks during the growing season. In any event, the patrol will give notice of conditions surrounding the line that might result in trouble of some description at a future time.

6. *Meter records*: Preserving records of sectional and master meters for study of minimum send-out periods is valuable for determining roughly in what areas leakage is increasing. If we know minimum send-outs existing under normal conditions, adjusted to existing degree day status, any significant new leak will be detectable.

7. *Over-odorization*: At regular intervals, the odorization rate in the case of artificially odorized natural gas, should be increased temporarily above that normally used, advance notice being given to street crews, installation and service men, meter readers, and complaint call operators. While this may temporarily result in additional complaints, it will also reveal many leaks where odor intensity had not attracted attention.

8. *Cooperation with associate utilities*, police and fire departments of the territory is of great importance. In the course of their work and inspections they may discover leaks, and conditions which may develop leaks, and it is important that their reports be accepted in an appreciative spirit. A free exchange of maps between the various utilities operating in the same area should be encouraged, and these maps of under-

ground structures should be studied carfeully by the maintenance men to determine the possible travel of escaped gas. Knowledge of this nature will speed up the locating of leaks which appear on the surface at a considerable distance from their source.

9. *Customers Reports*: Reports of the suspected presence of escaped gas communicated to the gas utility by customers should be given prompt attention, and no complaint investigation should be abandoned until the real nature of the complaint has been determined. Many instances come to mind where after abandoning a leak investigation because of faint or conflicting odors, real trouble has developed.

In keeping with our attempt to eliminate all avoidable leakage, distribution pressures should be held as low as possible consistent with good service to the customer. Upon removal of existing restrictions on the sale of gas for space heating, many gas companies will experience within a few years unprecedented peak demands upon their systems. Detailed planning of the methods of supply may result in the possibility of supplying good service with pressures lower than once thought possible. Automatic booster regulators, elevating pressures in accordance with the load, have been improved and are proving highly satisfactory under proper operating conditions. Service regulators are now available which will provide excellent operation over a wide range of inlet pressures, and should be used to keep unreasonably high pressures off the customers' premises.

The present period of lessened new business activity affords an excellent time to take stock of what we are doing about an adequate and comprehensive leak survey, and if we find a tendency to make this work a side line to be done by repair crews in their spare time, it would be well to take steps to see what can be done, what tools are needed, and who can do it.

ICI Plans Hartford Chapter

A meeting to discuss plans for forming a local chapter of the Indoor Climate Institute was held in the auditorium of the Hartford Gas Co., Hartford, Conn., on March 13, at which more than 60 representatives of heating and allied interests attended.

Edward C. Marsden, of Marsden and Wasserman, Hartford wholesale heating equipment dealers, acted as temporary chairman, introducing John K. Knighton, sales manager of the air conditioning division of Servel, Inc., Evansville, Ind., who gave a talk on the nature and purpose of the ICI.

A.G.A.'s Water Heating Contest for Home Service

AN essay contest on the subject "What Can Home Service Do to Aggressively Promote Adequate Gas Water Heating Service?", sponsored by the Water Heating Committee of the Residential Gas Section of A.G.A., has been announced by C. S. Stackpole, chairman of the Committee.

This contest is being held for the purpose of enlisting the aid of Home Service in promoting water heater sales and to provide a source of new publicity material on the subject.

Specific ideas are wanted—not generalizations. Any illustrative material such as pictures, cartoons, props, distribution pieces, etc., may be used. If desired, such appliances as the automatic washer may be tied in, or the relationship between hot water and health may be discussed, or housecleaning made easy with hot water, etc. etc.

Contest rules are as follows:

1. Contest is open to all Home Service Supervisory Directors and Home Service Representatives of Gas Utilities in the United States and Canada.

2. There is no limit on the number of words to be submitted.

3. Entries must be postmarked no later than midnight of Thursday, May 31, 1945.

4. All material submitted becomes the property of the Water Heating Committee of the Residential Gas Section and may be altered and used in any way in which the Committee decides.

5. Decisions of the judges will be final.

6. All entries must be typewritten on one side of the paper, preferably double spaced.

7. The contestant's name, address, company, and the name of her supervisory director, if any, is to be submitted on a separate sheet accompanying the entry. The contestant's name should not appear on the entry.

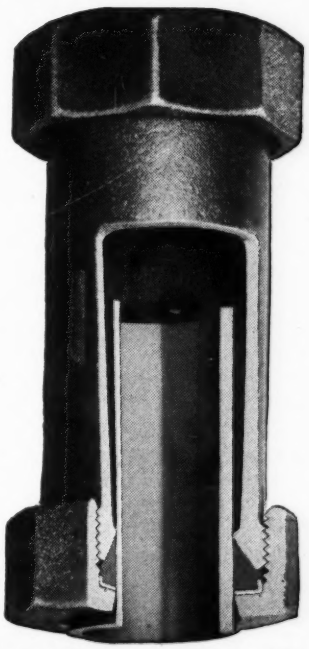
The following awards (in war bonds) will be made for the best papers: First prize—$150; Second prize—$75; Third prize—$50; Fourth prize—$25; Fifth prize—$25.

And in addition—Where a member of a department with a supervisory director wins a prize, the supervisory director will receive a special award of a $25 war bond. Only one prize may be won by any individual. If a supervisory director receives a regular award no special award will be made.

Judges of the contest are: Ada Bessie Swann, consultant in advertising, Woman's Home Companion, New York; Norman J. Radder, secretary, Plumbing and Heating Industries Bureau, Chicago; and M. M. Scott, advertising department, Ruud Manufacturing Co., Pittsburgh.

NORMAC

COUPLINGS, SLEEVES AND FITTINGS



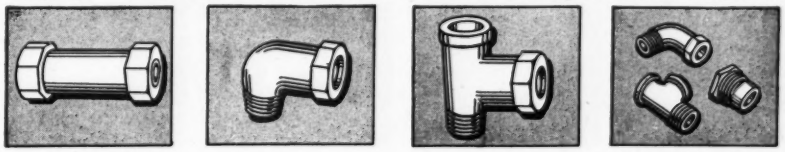
for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

Send for complete catalog.

NORTON-McMURRAY MANUFACTURING COMPANY
39 South La Salle St. Chicago, Ill.

Couplings - Meter Bars - Sleeves - Cocks - Bell Joint Clamps - Service Tees & Ells



TRENDS AND COMMENT

INDUSTRIALIZATION IN TEXAS

A Review of some steps planned by Lone Star Gas Co. to attract, establish, and serve new industries postwar.

Decentralization of industry from the heavily populated sections of the North and East to the Southwest, which has been evident for several years, is beginning to pick up momentum as war's end comes into view. Upon the supposition that this trend is to be accelerated, gas companies of the Southwest are laying plans to assist wherever possible in bringing these industries to their territories

Small industries rather than large, it is expected, will furnish most of the increased industrial gas load in the immediate postwar era. The agricultural economy of Texas, it appears, is to be combined with the small industrial plants to produce a typical Southwestern prosperity.

For example, Texas is dotted with small cheese plants erected by some of the large cheese companies of the North and some of the national dairy chains. This has brought about a change in farming operation in some localities from the one-crop cotton activity to the well-rounded farm in which dairy cattle play a large role.

Such items as dehydration plants, alfalfa drying plants, seed drying plants, egg drying, small slaughter houses and packing plants, smoke houses, frozen food lockers are along this line of endeavor. All of them have come to Texas within recent years. As further examples of the industrial trend, glass and tire plants recently have been erected in Texas.

Gas has played a prominent role in this movement, but other factors have been equally important. Some factories have come to Texas because of a desire for more convenient distribution centers, better climate, raw products, and in some cases, a better class of labor. Some factory managers state that workmen from Texas farms and small towns, when properly trained, make highly skilled workers who take a greater interest in producing better products than workers do in some other sections.

In order to take full advantage of this trend some gas companies, among them Lone Star Gas Co., have under consideration plans to do a great deal of work with chambers of commerce. They are planning, when their staffs of industrial engineers can be increased to the maximum, to regularly contact industrial departments of the commerce organizations in their territories for the purpose of offering every possible assistance to prospective industries.

Here is the sort of general information available to prospective industries through Lone Star Gas Co.'s industrial department: The prospect is quoted the gas rate applicable for the proposed plant, and he is furnished with maps and plats showing the location of pipelines in the area contemplated for such a plant. He is furnished data with respect to the quantity of gas Lone Star is able to supply over and above its present customer requirements in the particular area; he is told about the company's gas reserves, its interconnected pipeline system, the number of wells and the fields from which they take gas, about pipeline bridges and the various other facilities that would prove advantageous in locating an industrial plant in the territory.

When a plant is actually established and in operation, the company's industrial department is available for adjusting controls and checking gas-fired equipment for operating efficiency. The engineers check equipment for proper gas utilization, and they also determine whether the proper size and type burners have been installed for a particular job. The engineers are available, at customer's request, for tests to increase efficiency of gas-fired equipment in use.

How industrial engineers can actually save money and set up improved facilities for industrial users is shown in the following case: The prospective industrial customer was planning to establish a seed corn drying plant and he needed a large air heater. He followed recommendations of Lone Star engineers and converted a 100-hp. horizontal return tubular boiler from an abandoned steam gin. The engineers also designed the air heater from the abandoned gin boiler and drew up specifications for the automatic control system required in the seed corn drying process.

And now, through the use of gas in drying seed corn, a process has been perfected which is more dependable than nature, for the drying process makes it possible to remove a certain, definite quantity of moisture. This is brought about through the use of the automatically controlled gas air heater which maintains a constant temperature of 110° F. that permeates the corn in bins. The corn is dried by means of heated air until all but 12% of its moisture content has been removed. That 12% prevents deterioration.

To produce the gas air burner, the inside tubes and ends of the gin boiler were cut away, leaving only a cylindrical shell open at both ends. The automatically controlled gas burner was mounted in one end, but not sealed in. The other end of the open boiler shell was connected to a large air blower, capable of delivering 65,000 cu. ft. of air per minute. This blower pulls in the air around the open burner flame and through the boiler shell, delivering heated air by means of ducts to the corn drying bins.

The air is sent to the bins at 110° by means of a thermal bulb suspended in the air duct near the outlet of the blower. This thermal bulb actuates an air operated recording-throttling controller; the controller in turn modulates the flow of gas to the burner, thereby maintaining a constant drying temperature of 110°.

Service of this type rendered by Lone Star Gas Co. will be available even on a large scale after manpower and other war restrictions have been removed, and the company will be able to go all-out in its proposed postwar program of helping attract new and greater industrial plants to Texas and the Southwest.

4 REASONS WHY
WOMEN WILL LOOK FOR THIS SEAL ON THEIR NEW GAS RANGES
Reason #1
CP
ONLY THE WORLD'S FINEST COOKING APPLIANCES BEAR THIS SEAL
Only Gas Ranges Built to the Highest Standards of the Association of Gas Appliance & Equipment Manufacturers bear a "CP" Seal in addition to their own brand name.
THEY WILL LOOK FOR THE "CP" SEAL IN YOUR NEW KITCHENS
Gas Ranges Bearing The "CP" Seal Will Be Made By The Following Manufacturers

One of the Association of Gas Appliance and Equipment Manufacturers current CP Range advertisements, which are appearing in a total of 18 publications. This one is scheduled for the April and May issues of "Architectural Forum," "Architectural Record," "American Builder," and "Practical Builder." The agency: Hill Advertising, Inc., New York City.

PIPELINE NEWS

• **Panhandle Eastern Pipe Line Co.** was authorized by FPC early in April to augment its present daily deliveries of 333,000,000 cu. ft. by 50,000,000 cu. ft. The new construction is expected to be completed by Nov. 1 at a total cost of $8,325,000.

Principal facilities to be constructed are:

1. New 2400-hp. compressor station in the Hugoton gas field of Kansas, $435,000;

2. Additional compressor units at existing compressor stations as follows:

a. Four 1300-hp. units at Greensburg, Kans., $950,000.

b. Three 1300-hp. units at Haven, Kans., $700,000.

c. Five 800-hp. units at Olpe, Kans., $700,000.

d. Five 1000-hp. units at Louisburg, Kans., $1,135,000.

e. Four 1300-hp. units at Houstonia, Mo., $940,000.

f. Four 800-hp. units at Centralia, Mo., $525,000.

g. Four 800-hp. units at Pleasant Hill, Ill., $525,000.

h. One 1000-hp. unit at Glenarm, Ill., $325,000.

3. Thirty-two miles of 24-in. loop line are to be constructed in Ohio and Indiana at a cost of $1,077,000;

4. Valves along the Company's main line No. 200 are to be changed at a cost of $455,000;

5. Improvements are to be made at the Company's compressor stations at Hansford, Texas, Liberal, Kansas, Tuscola, Illinois, Montezuma, Indiana and Zionsville, Indiana.

Panhandle will use the increased capacity principally to supply the Ohio Fuel Gas Co. at two existing pipeline interconnections, one near Maumee, Ohio, the other at the Ohio-Indiana state line east of Muncie, Ind. Of the 50 million cu. ft. daily increase, 25 million is to be delivered for 20 years; the 25 million for five years from the date of first delivery.

In authorizing the construction, the power commission stipulated that the facilities are not to be used for either the transportation or sale of natural gas, subject to the jurisdiction of FPC, to any new customers of Panhandle without specific prior authorization, and that Panhandle is not to terminate any service rendered by the facilities to Ohio Fuel Gas without first obtaining commission approval.

• The FPC has received an application filed by the **American Light & Traction Co.**, a holding company with principal offices at Rockleigh, N. J., for permission to construct and operate a natural gas pipeline of ultimate 320,000,000 cu. ft. daily capacity between a point in the Hugoton gas field near Guymon, Okla. and markets in Missouri, Iowa, Illinois, Wisconsin and Michigan. The terminus would be near Detroit.

If approved, the main line as finally completed would be about 1215 miles in length, the initial construction being limited to about 1076 miles, the application states. Eight hundred and sixteen miles would be constructed of 26-in. pipe and the remainder of 22-in. Initial capacity of the line would be 150,000,000 cu. ft. per day. Through use of Austin and other gas storage fields in Michigan, now owned by American Light & Traction's subsidiary, Michigan Consolidated Gas Co., a maximum day's requirements in excess of 630,000,000 cu. ft. could be supplied by the fully completed system, the application says. It adds that Michigan Consolidated proposes to construct about 140 miles of 26-in. line connecting the Austin field with the Detroit area, as well as a compressor station at the Austin field.

The gas supply for the proposed pipeline would be purchased from gas reserves in the Hugoton field in Texas and Oklahoma, owned and controlled by Phillips Petroleum Co., and estimated to be not less than three trillion cu. ft., according to the application and total sales for the fifth year of operations are estimated at 105,120,000,000 cu. ft. a year.

The total overall cost of the initial construction is estimated to be $49,000,000, according to the application, which also estimates that additional construction during the first four years of operation would bring the total cost of the completed project to $70,000,000.

• The FPC has set a hearing for May 9, on an application filed by **Cities Service Gas Co.**, Oklahoma City for authority to acquire from its affiliate, Cities Service Transportation and Chemical Co., and to operate the 231-mile Hugoton natural gas pipeline. The facilities include the 26-in. line extending east from a point near Guymon in the Hugoton gas field in Texas county, Okla. to Cities Service Gas Co.'s Blackwell compressor station in Kay County, Okla., a compressor station and dehydration plant at the western terminus of the line, and appurtenances. The line, which has been completed, was built to the relieve a natural gas shortage in the mid-continent area under authorization of the FPC's orders of Sept. 30, 1943 and July 22, 1944.

According to the application; Cities Service Gas Co. proposes to acquire the facilities at their cost to the Transportation company less reserves for depreciation. On Feb. 28, 1945, the cost of the property to be acquired was $10,700,757 and the reserves for depreciation were $317,328, the application says. Cities Service Gas Co. proposes to finance $9,000,000 of the cost of acquisition by the issue at par of $9,000,000 par value of its capital stock to its parent, Empire Gas and Fuel Co., and to disburse funds from its own treasury to cover the balance.

• A hearing has been set for May 2, by the FPC on an application filed by the **Northern Natural Gas Co.**, Omaha, for permission to construct and operate additional facilities which would increase the delivery capacity of their system by about 8,000,000 cu. ft. per day. These facilities would include an additional 1300-hp compressor unit at the company's Bushton and Mullinville, Kans., compressor stations and about 15 miles of 24-in. loop line extending from a point in Ellsworth County to a point in Ottawa County, Kans., with 16-in. tie-over lines and appurtenances. The estimated overall cost of the project is $910,848.

STANDING GUARD
FOR
Economy
Precision engineered for sturdiness, long life, and trouble-free service, the H-M Low Pressure Regulator saves labor and money. Regulating and controlling your gas flow through the use of H-M Regulators you can solve your pressure problem.
Send for complete details regarding available sizes and specifications.
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POST-WAR NOTES and NOTIONS

By STANLEY JENKS

Foolproofing

Gazing into the post-war crystal ball, different men see different things. Some see—but we've been over the extravaganza in plastonics so much these last several months that it would be perhaps better to assume with other reasonable men that such bubbles will bust with the pressure of their own futility.

Stanley Jenks

Then again, our own official post-war planners envision "a kitchen that kisses you 'chores' good-bye!" (Leading national publications, April and May.) This is the coordinated kitchen so graphically described in the A.G.A. advertisement just mentioned. The idea is to get the little lady back in the kitchen, I gather, and revel in the newly found freedom of modern gas service with all the trimmings. ("You'll have more fun, more freedom in these marvelous, modern workshops.")

Of course, there is the public angle too. The very day I received a letter from the A.G.A. staff member, expressing disappointment over some comments of mine on this page in March, the *Philadelphia Inquirer* printed a letter from a reader, who must be a sourpuss too. May I quote?

> "We are reading a lot about the wonderful 'post-war' inventions that we shall enjoy . . . I am wondering if they are really new in design or just new in appearance. Take, for instance, the gas range: will the handles be in the same old place, on the front, where a child can turn them on? . . . I believe a lot of 'safeties' can be built into some of these things so that parents won't have to follow the baby around to see that it doesn't get into mischief—and I do mean definitely. There is enough streamlining now in most of our gadgets. What we need is more 'fool-proofing'."

That letter prompted me to ask questions here and there. Everybody I talked to seemed to think that first things first even in our post-war Utopia isn't such a bad idea after all.

K.P.

Incidentally, going back to the A.G.A. advertisement which prompted the foregoing, will somebody please answer the question for me asked by one of the women I interviewed.

As a veteran dish launderer and china polisher, and with the whole gas industry planning my future K.P.—where in heck is the kitchen sink?

I want more fun and freedom too in the marvelous, modern workshop.

Publicity

The appointment of George A. McDonald to the A.G.A. staff as director of publicity is welcome news indeed. As a professional newspaperman, well versed in public utility affairs, he fills a long-felt need. The gas industry has a good story to tell. George Segeler of the A.G.A., in his talk—recommended "must" reading—before the New York Society of Security Analysts in February, set an excellent pattern for similar talks locally. Insiders are well aware of the industry's vital contributions to the war effort, and we all sense the significant part we can and will play in the post-war world. But others have been stealing the headlines far too frequently, and public opinion has steadily grown lukewarm despite our excellent war record.

The Cost of Capital

It was John B. Klumpp, experienced utility consulting engineer, who advanced the thought at the last A.G.A. annual meeting that it would be wise to get ourselves better understood by the investment bankers. Nobody, despite today's easy money, can question the long-range wisdom of the idea.

Even today, in investment banker circles, gas company securities in general enjoy nowhere near the same esteem as corresponding electric securities.

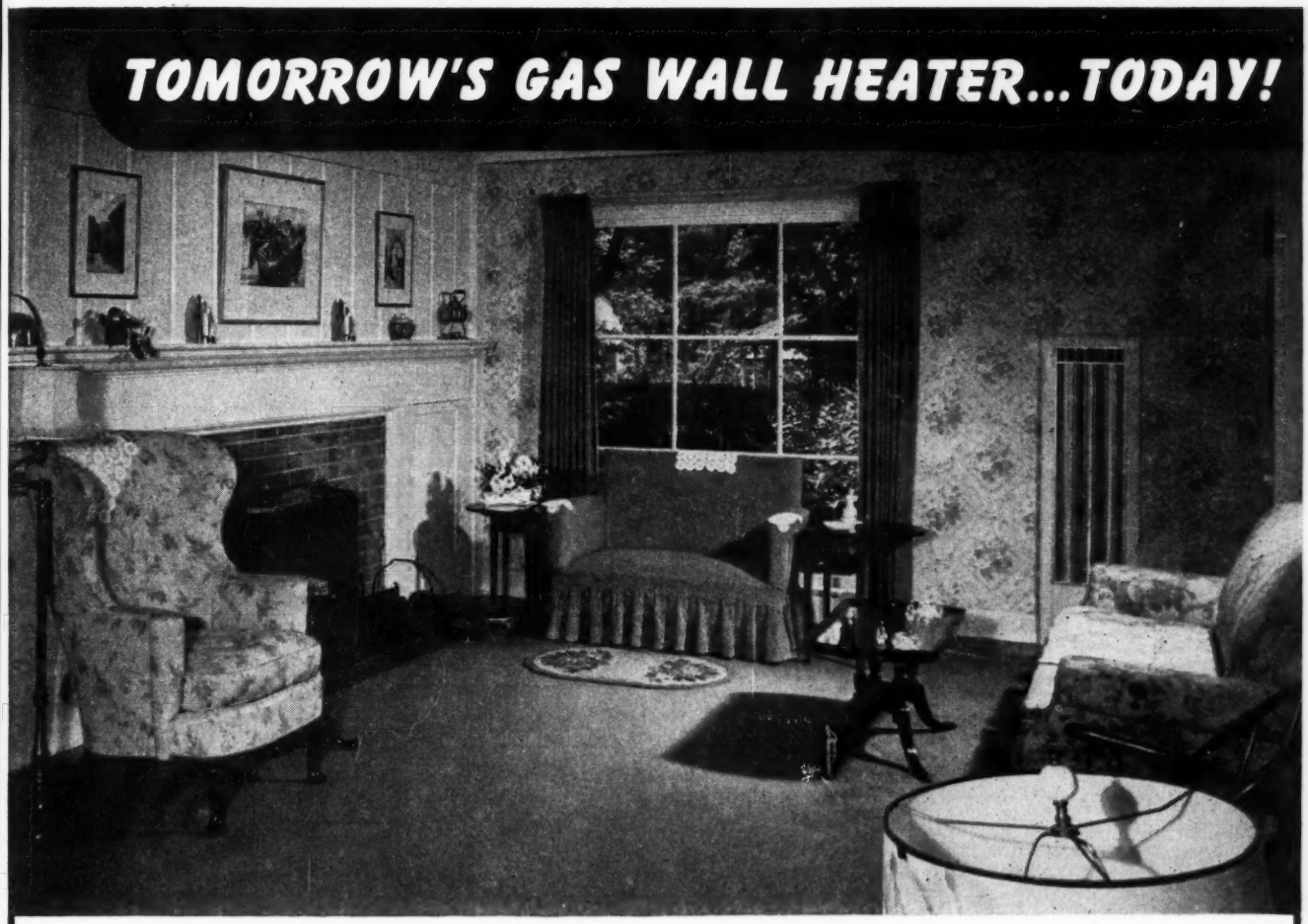
The rough and ready rule in appraising equity stocks is the current "times earnings" yardstick applied to groups of like-sized straight gas and electric or combination companies. For example, the stock market might show an average stock price to be X times the earnings (not dividends) of a certain comparable group of utility stocks. Your investment banker figures accordingly.

The gas industry cannot ignore the painful fact that, with few exceptions, your investment banker feels electric securities rate a higher multiplier than gas. This means one of two things. Either the gas industry lacks the future potentialities of the electric industry—for no investment banker worth his salt deals solely in the present—or else these men who control and steer the flow of venture capital are in ignorance of the real facts. The former is an impression. The latter, of course, is the truth.

The gas industry is the sum of its local operations. Nationally, it unites its research, development, and general promotion. This will inevitably create better impressions, but in the last analysis, real post-war strength will lie in its ability to outmatch its fuel competitors in every city, town, village, or crossroad—wherever it is challenged.

Then, and only then, will the income statements and balance sheets more than offset the unfavorable impressions in banking circles, and gain for the industry the needed venture capital at costs not disadvantageous to us in the forthcoming "Battle of the Fuels."

TOMORROW'S GAS WALL HEATER...TODAY!



The gas industry is presented with an advanced contribution to gas heating comfort with the new PANELRAY wall heater.

Day & Night's PANELRAY uses a principle of heating as old as the sun but as new as tomorrow in its application to gas wall heaters. The healthful infra-red rays of sunlight are radiated by PANELRAY throughout the "living zone." Instantly, body penetrating warmth changes cold shivers into cheering comfort.

PANELRAY'S exclusive patented "heat trap" assures economical operation and customer satisfaction. Easy to install, simple in operation, the PANELRAY fits any wall, high or low...any room, large or small...any building, old or new. Available, packaged and ready for quick installation, in 10, 20 or 30,000 BTU single units and in 20, 30 or 40,000 BTU dual units.

PANELRAY is fully vented and is designed to use all types of gas for manual operation or with wall thermostat.

WRITE FOR FULL COLOR BOOKLET GIVING COMPLETE FACTS

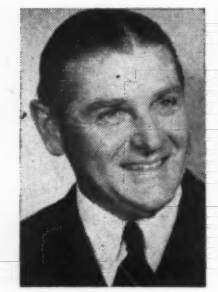
DAY & NIGHT MANUFACTURING CO.

MONROVIA CALIFORNIA

One of the Dresser Industries

PEOPLE

• **Commander Elmer Shaw Pettyjohn,** USNR, has been named director of the Institute of Gas Technology at Illinois Institute of Technology, succeeding **John I. Yellott,** who has held the position since Sept. 1, 1943. Yellott will leave



E. S. Pettyjohn

L. J. Willien

the Gas Institute as of May 1 to become director of research with the Locomotive Development Committee of Baltimore, Md.

L. J. Willien, associate director, will be in charge until the time when Pettyjohn's naval assignment is terminated, according to the announcement by **Dr. Henry T. Heald,** president of Illinois Tech and the Institute.

Pettyjohn is at present absent from the country as head of the oil section of the United States Strategic Bombing Survey and as liaison in the United States Naval Technical Mission. His primary research in the field of gas engineering has concerned the production of carbureted water gas, the use of bituminous, coking and non-coking coals and crude oil as water gas generator fuel, and evaporation and heat transfer. He has had extensive experience as a consultant to numerous gas companies.

L. A. Mekler, combustion engineer and member of the engineering and development department for Universal Oil Products Co. since 1927, has assumed a new position as engineering consultant to the Institute of Gas Technology and the Armour Research Foundation of Illinois Institute of Technology. A member of ASME, AIME, ASTM and a past member of the American Ceramic Society, Mekler has been listed in "Who's Who in Engineering" since 1931. He is an outstanding inventor, author and lecturer on such subjects as combustion, furnaces, petroleum heaters and petroleum refining processes.

• **Henry M. Brown,** director of natural gas and gasoline for the southwestern states (PAW's District III) resigned as of a recent date, because of ill health according to an announcement by **Ralph K. Davies,** deputy petroleum administrator.

Brown had had 20 years experience in the executive, legal, financial and marketing branches of the oil industry. In 1929, he was named vice president and treasurer of the Missouri Valley Gas Co., with headquarters in Omaha and New York City. From 1931 until 1941 he was associated with the Texas Gulf Producing Co., Houston, as vice president. During the first two years of that period he also held the position of vice president and treasurer of the Republic Gas Corp., Houston. He became president of the Midland Gas Company in Houston in 1932, and joined PAW in 1943, taking a leave of absence from Midland.

• **S. B. Irelan,** president of the Cities Service Gas Co., Oklahoma City, has been elected a member of the board of directors of the Cities Service Co., to fill a vacancy caused by resignation of Valentin R. Garfais, of Mexico City.

Following his graduation in electrical engineering from Purdue University, Lafayette, Ind., Irelan went to work as cadet engineer for the Denver Gas & Electric Co. Since then he has been engineer, secretary and treasurer, statistician, financial representative, vice president and general manager of Cities Service, Co-operated railway, light and gas companies, in St. Joseph, Mo., Montgomery, Ala., Bartlesville, Okla., and Sedalia, Mo.

• **Michael Griffin,** of Madison, Wis., on April 20 became assistant director of public relations of the Petroleum Administration for War.

Griffin succeeds **Ludwig Caminita, Jr.,** of Arlington, Va., who recently was promoted to director of public relations by Petroleum Administrator **Harold L. Ickes.**

After four years as Washington correspondent for TIME Magazine, Griffin became city editor of the Louisville (Ky.) Courier-Journal a year ago, resigning to accept his present appointment.

• **James A. Schultz** has recently been elected assistant treasurer of Consumers Gas Co., Reading Pa., it was announced by **Allyn C. Taylor,** president of the company. Schultz is also secretary and treasurer of the Reading Gas Co.

Prior to his joining the gas company in 1924, Schultz was affiliated with the Standard Steel Car Co., Pittsburgh, and Hecht Co., Washington, D. C., and also served in various capacities with the United States Treasury Department in Paris, France and Washington. He is a member of the American Gas Association and is currently treasurer of the Pennsylvania Gas Association.

• **Samuel S. Pharr** has been appointed a member of the Tennessee State Railroad and Public Utilities Commission, succeeding **Porter Dunlap,** who recently resigned, according to an announcement made by **Gov. James N. McCord.** Pharr, who assumed his duties April 1, had been serving as attorney for the Memphis and Shelby county public utilities research department.

• **H. Carl Wolf,** president, Atlanta Gas Light Co., and Chairman of the Committee on National Advertising of the American Gas Association, announced the following two changes in personnel of the committee:

C. S. Stackpole, Consolidated Gas Electric Light & Power Co., Baltimore, will represent participating companies in Maryland, District of Columbia, Virginia and Kentucky. He replaces **Marcy L. Sperry,** president, Washington Gas Light Co.

H. S. Christman, Philadelphia Gas Works Co., Philadelphia, replaces **Fred B. Hofft,** United Gas Improvement Co., Philadelphia. Christman will represent companies situated in eastern Pennsylvania and Delaware.

Both men were elected to the committee by vote of participating companies in their respective territories.

• **Donald M. Moroughan** was appointed domestic sales manager of the New Jersey Power and Light Co., effective March 1, filling the vacancy created by the recent election of **William F. Moses** to vice president in charge of customer and employee relations.

Moroughan's 20 years' experience in the utility business started in Messina, N. Y., in 1925. From 1929 to 1934 he was employed by the New York State Electric and Gas Corp., Ithaca and Walton, N. Y., and from 1934 to 1945 he served as sales supervisor for Metropolitan Edison Co., Easton, Pa. He has also been associated with New Jersey Power and Light Co. at Phillipsburg, N. J.

• **Henry Bostwick,** manager of the Pacific Gas and Electric Co.'s San Francisco division, retired April 1. Bostwick was president of the Pacific Coast Gas Association in 1922 and its secretary from 1912 to 1920.

Henry Bostwick

Also retiring is **I. B. Adams,** manager of the San Jose division of the company. **T. W. Snell,** now manager of the Coast Valleys division at Salinas, will become manager at San Jose, and **N. R. Sutherland,** now manager of the commercial department in the general office, will become manager at San Francisco. **J. F. Pollard** will become manager of the commercial department in place of Sutherland, and **Emmett Ward,** now in Richmond, will replace Snell.

• The Election of **Capt. Henry Fink** as vice president and member of the board of directors of the Michigan Consolidated Gas Co., Detroit, was announced by **Chairman William G. Woolfolk.** Fink will continue his duties as general manager of the Detroit district. All other officers of the company were re-elected.

• **Edgar S. Coffman** has been appointed chief of the division of rates and research of the Federal Power Commission, succeeding **H. Zinder.** Coffman has been with the commission for 11 years (1933-1944) in various capacities, his most recent position being that of

principal rate investigator. Prior to entering the federal service he was with the Power Authority of New York and spent six years as staff engineer with the Indiana Public Service Commission.

• **Joseph A. Reynolds** has been appointed acting retail sales supervisor in the new business department of the Brooklyn Union Gas Co. For the past year he had been filling the post of acting assistant personnel director, and prior to that he was district sales manager of the Newtown branch.

• **Alexander Macomber** has resigned from the fuel and allocations branch of the Office of War Utilities and will devote all of his time to the affairs of the gas division, of which he is director. **M.O.L. Hooper** has been appointed chief of the fuel and allocations branch, and **Clifton B. Gleaves** will serve as deputy chief.

• **George G. Kuhn**, purchasing agent for United Light and Power Service Co., Davenport, Iowa, has retired. **Waldo H. Fahrner** will serve as acting purchasing agent until a permanent appointment is made. Kuhn's retirement marks the end of a 45-year period of service in the public utility field.

• **Walter R. Keagy** has been appointvice president of the Cincinnati Gas & Electric Co., it was announced by **H. C. Blackwell,** president of the company. Keagy joined the Cincinnati Company in 1929 as manager of its Customer Service Department. He is secretary-trustee of the Cincinnati Electrical Association and is a member of the Customers' Relations Committee, Accounting Section, of the American Gas Association.

• **Joseph A. Corgan** has been appointed chief of the Anthracite and Coke Section of Economics and Statistics Service, Bureau of Mines, according to a recent announcement by **Dr. R. R. Sayers,** director.

Corgan, an authority on the economics of coal, coke and other fuels, has been with the government since 1937 and with the Bureau of Mines since 1940. He has served as acting chief of the section for the past 6 months.

• **Samuel C. McLaughlin,** formerly of Fitchburgh, Mass., has been made general manager of the Claremont, N. H. Gas Light Co., succeeding **Charles Morgan,** who sold the company because of ill health.

• **Ernest J. Howe,** vice president of New York, Pennsylvania & New Jersey Utilities Co., has been named vice president in charge of finance for Rochester Gas & Electric Corp.

• **Paul B. McKee,** president of the Portland Gas & Coke Co., Portland, Ore., has been named a member of the 1945 executive committee of the National Association of Manufacturers.

Manufacturers

• **Major William D. Antrim** has returned to the Bryant Heater Co., after nearly two years of service with the United States Army Ordnance Department as a supervising research and development expert on artillery ammunition, according to announcement by **Lyle C. Harvey,** president.

W. D. Antrim

Antrim will devote his time exclusively to the adaptation of the new Bryant automatic safety pilot to gas range ovens and broilers. In gas range design and control he pioneered many developments, especially the adaptation of single point flash tube ignition to gas ranges.

Antrim, prior to his military service, was engaged in research and development on controls for Bryant. Previously, he was associated for 17 years with the Roberts and Mander Stove Co. as chief engineer.

• **Donald S. Woods** will be in charge of sales of the Evanair furnace and water heater section, according to an announcement made by **Al Shields,** general

COMPLETE DATA ON A
Complete Line
When war regulations are lifted to permit manufacture again, Utility will be ready with a complete line of gas-fired Floor Furnaces, Unit Heaters, Circulating Heaters and Forced Air Furnaces, Illustrated literature on these outstanding appliances will be sent on request.
UTILITY Appliance Corp.
Formerly Utility Fan Corporation
Floor Furnaces
Unit Heaters
FORCED AIR FURNACES
Circulating Heaters
Standard Blowers
4851 S. Alameda St., Los Angeles 11, Calif.

sales manager of the Evanair division of the Evans Products Co., Detroit, makers of the Evanair line of home heating equipment.

Before the war, Woods was connected for 22 years with the American Radiator & Standard Sanitary Corp., the last 12 of which he was sales manager of the company's Detroit branch. He came to the Evans organization from WPB, where he was chief of the plumbing and heating branch of civilian requirements for more than a year. Before that he was technical advisor on plumbing and heating for the National Housing Agency.

J. O'H. Anderson

H. B. Spackman

• Appointment of **J. O'H. Anderson** and **H. B. Spackman** to be assistant general managers of sales, effective May first, is announced by Jones & Laughlin Steel Corp., Pittsburgh. Anderson has been manager of sales, tubular products, and Spackman has been district sales manager, Philadelphia Office.

Other Jones & Laughlin sales office appointments, effective May first, are:

V. A. Jevon, assistant general manager of sales, to be in charge of Pittsburgh district sales office activities; **C. T. Hapgood,** formerly assistant manager of sales, tubular products, to be manager of sales, tubular products; **E. W. Harwell,** formerly district sales manager, Chicago office, to be district sales manager, Philadelphia office; **L. C. Berkey,** formerly district sales manager, St. Louis office, to be district sales manager, Chicago office; and **C. C. Wehling,** formerly district sales manager, Pittsburgh office, to be district sales manager, St. Louis office.

Change of office address in Chicago was also announced for the Jones & Laughlin district office and the office of Jones & Laughlin Supply Co. from their present locations, to the Field Building, 135 So. LaSalle St., Chicago 3.

• The appointment of **L. E. Osmer** as sales manager of the Girdler Corp.'s gas process division, Louisville, Ky., has been announced by **W. R. Wood,** vice president of the company. Osmer began his business career with the Semet Solvay Engineering Corp., as a cadet engineer in 1923. He was a construction superintendent for the firm for four years and in 1928 was promoted to the sales engineering staff. From 1930 until 1943, when he joined Girdler's gas process division, he was Semet Solvay's district representative for the midwest, with headquarters in Chicago.

• **Norman A. Johnson** has been appointed field representative of the A. O. Smith Corp., Seattle office, **J. E. Woodall,** manager of the firm's home appliance division announces. Johnson was a district sales supervisor before he joined the navy, from which he was discharged after a year's service as radio operator. In the past he has been connected with the Public Service Co. of Northern Illinois, the Northern Indiana Public Service Co., and the Clark electric water heating division of the McGraw Electric Co.

• **G. M. Rohde, Jr.,** has rejoined the Ruud Manufacturing Co., makers of automatic gas water heaters, Pittsburgh, Pa., as assistant to the president, **R. H. Lewis,** and will be in charge of special assignments.

Rohde was at one time western manager for Roberts & Mander and following that a member of the Ruud-Monel promotion staff. When war came, he was loaned to the Training Within Industry of the War Manpower Commission and subsequently became associated with the Westinghouse Electric & Manufacturing Co. as manager of rural electrification at Pittsburgh.

• **C. E. Mason** has been appointed technical director of the Bristol Co., Waterbury 91, Conn., manufacturers of automatic control and recording instruments, according to an announcement made by **L. G. Bean,** vice president in charge of engineering and sales.

In 1940 Mason received from the National Association of Manufacturers', Committee on Patent and Research, a special award as one of the country's Modern Pioneers for his accomplishments in the field of automatic control. He will make his headquarters at the general offices of the company.

• The promotion of **Harold O. Dysart** to secretary and the reelection of the present members of the board of directors and officials of the Tappan Stove Co., Mansfield, Ohio, has been announced, following the annual meeting of the stockholders and directors. Dysart has been in the employ of Tappan since 1922 and has been assistant secretary since 1934. **A. C. Rhoads,** former secretary-treasurer will remain as treasurer.

• Promotion of **C. M. Bovard** from the position of chief draftsman to design engineer and the elevation of **Ralph H. Schlosser** to chief draftsman is announced by the Cooper-Bessemer Corp., diesel engine and compressor manufacturer. Bovard is a veteran of 20 years of service with the company and Schlosser has served in the company's drafting room for 31 years.

• The appointment of **P. M. Hutchins** as manager of advertising and sales promotion for the National Radiator Co., Johnstown, Pa., was announced the latter part of April by **R. S. Waters,** president of the company. In recent years, Hutchins has been associated with the Pittsburgh Sun-Telegraph as general promotion manager. He has already assumed his new position, with headquarters in Johnstown.

• **Val Link,** sales engineer at the Shreveport office of Westcott and Greis, division of American Meter Co., has been transferred to that company's Dallas branch in the same capacity. Link has been sales engineer at Shreveport for eight years, prior to that he was affiliated with the United Gas System.

• **C. S. Stuckenholtz,** sales manager for the W. J. Schoenberger Co., of Cleveland, manufacturer of valves and fittings for the LP-Gas industry, announces the appointment of **Fred F. Alleman** as West Coast manager. Alleman's offices are located at 1709 West Eighth St., Los Angeles 14.

• **Maurice P. Greffoz** has been appointed field service representative for Torrance Oil Heaters, manufactured by Tivit Products, Inc., Los Angeles. He will give constructive assistance in the solution of service and operational problems concerning the heating of oil in the field.

• **Livingston B. Keplinger,** vice president of Rheem Manufacturing Co. was reelected president of the Steel Shipping Container Institute Inc., at its annual meeting at the Waldorf Astoria, March 26.

Obituaries

• **Franklin H. Nickerson,** retired vice president and trustee of the Consolidated Edison Co. of New York, died at his home in Redding, Conn., on March 30. He retired at 65 in 1944. All except three of his 47 years of service with the Edison System Companies were spent in accounting, statistical and financial work. He was made vice president in charge of finance and statistics of the Consolidated Gas Co. in 1929. Since the 1936 mergers which brought about the present corporate setup until his retirement, he was vice president of Consolidated Edison, as well as trustee. He was also a director of the Brooklyn Edison Co., New York and Queens Electric Light and Power Co., New York Steam Corp., and Westchester Lighting Co.

• **Marshall Ashby Gibbs,** Office of War Utilities official and former commercial manager of Washington Suburban Gas Co., died unexpectedly at his home in Silver Springs, Md., at the age of 43.

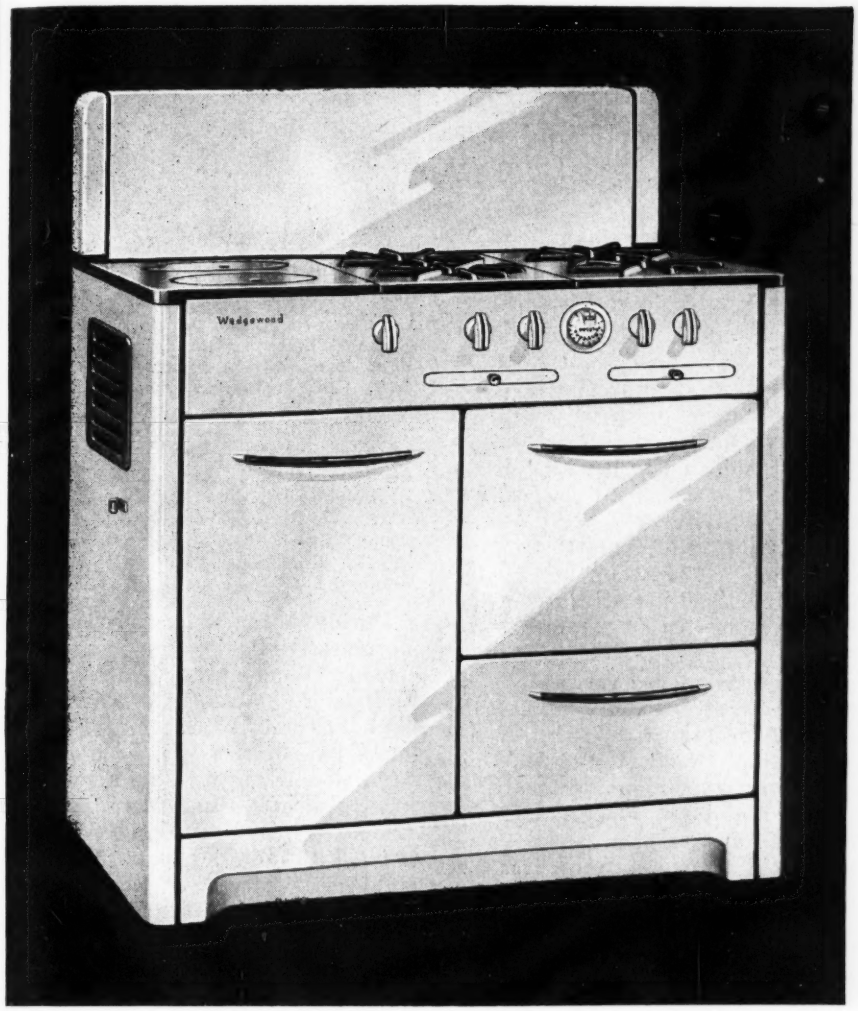
Gibbs was associated with the Georgetown Gas Light Co. from 1923 until its consolidation with the Washington Gas Light Co. in the early 1930's. He was named chief of the allocations unit of the natural gas section of the OWU gas division in 1943.

• **Charles B. Nash,** vice president and director of publicity of American Radiator and Standard Sanitary Corp., Pittsburgh, died recently at the age of 65. Nash started his advertising career in 1903 in the employ of the Standard Sanitary Manufacturing Co. in Pittsburgh.

• **Hannie J. Kister,** retired executive of the Los Angeles Gas and Electric Co., died March 25 at the age of 69. Starting in 1901, Kister held a long series of executive positions with the company. Just prior to his disability retirement, he was purchasing agent.

• **P. E. Warren,** manager of Lone Star Gas Co.'s Cleburne district of distribution, died recently, at the age of 55.

• **Joseph J. Brennan,** vice president of the Memphis Light, Gas and Water Division, Memphis, Tenn., died Feb. 19.



"I make friends
by selling
WEDGEWOOD
the Gas Range
with
quality appeal"

● Old-timers in the appliance business know that **WEDGEWOOD** has earned its wide popularity because it has "Quality Appeal." Women know that for baking, broiling or top-of-stove cooking **WEDGEWOOD** stands alone in excellent performance. To sell a **WEDGEWOOD** is to make a life-long friend for yourself, your store and for GAS, the *modern* fuel.

For 63 years — since 1882 — the James Graham Mfg. Co. has insisted on *quality* being built into every gas range that leaves their factory. Not only is this a point of pride, it is in the **WEDGEWOOD** tradition to produce only the finest. And when our war contracts are finally completed, dealers may confidently expect a **WEDGEWOOD** gas range superior to anything in the field.

MODERNS PREFER GAS

FOR ALL GASES, INCLUDING LP (LIQUEFIED PETROLEUM) GAS

WEDGEWOOD THE MODERN GAS RANGE

JAMES GRAHAM MANUFACTURING CO.

LOS ANGELES ★ SAN FRANCISCO ★ NEWARK, CALIFORNIA ★ PORTLAND, OREGON

ASSOCIATIONS

Short Course Draws 594 Attendance

By O. D. HALL

REPRESENTATIVES of gas, oil and allied companies from 25 states and the Dominion of Canada attended the 20th Southwestern Gas Measurement Short Course at Norman, Okla., April 17-19, in the face of destructive floods and other travel difficulties.

The attendance, recorded by Miss Kate A. Niblack, chairman of the registration committee. stood at 594 at the close of the school.

W. H. Carson, dean of the school of Engineering, University of Oklahoma, told the opening session that letters from many states and several foreign countries which produce oil and gas had convinced federal authorities that the Short Course is a wartime educational necessity. Approval of the 1945 school followed.

Aside from the welcome accorded to the school by Dr. G. L. Cross, president, University of Oklahoma, and Dean Carson's remarks, only one address was delivered, that of Frank S. Kelly, Jr., President Southern Gas Association. The remainder of the talks and papers were in the nature of reports of committee heads, lectures and demonstrations by university and manufacturing company instructors before the morning general sessions and afternoon classes.

Near the close of the session the selection of C. A. Gibson, Cities Service Gas Co., Bartlesville, Okla., as General Chairman of the 1946 Short Course was announced. For the past year he was chairman of the program committee. He succeeds Earl Kightlinger, Arkansas-Louisiana Gas Co., Shreveport, La., as chairman.

Kelly is the first to hold the office of president of the Southern Gas Association for the second term, having recently been re-elected to that office. He painted a bright picture of the future of the gas industry, if not too rigidly controlled by government agencies.

At the opening general session, W. H. Woods, Gulf Oil Corporation, submitted his report as chairman of the Committee of Practical Methods. During the year this committee had prepared a report on, "Instructions for Changing Charts," a small type pamphlet of 22 pages, which was distributed to all who registered.

Chairman Earl Kightlinger announced the prize winning papers written by registrants at the 1944 session on the subject: "What I Learned at the Gas Measurement Short Course".

Winners were:

First prize—Miss Jane Pfeifer, Warren Petroleum Corp., Tulsa, Okla.

Second prize—W. H. James, Lone Star Gas Co., Ballinger, Texas.

Third prizes (five)—Russell Davis, West Michigan Consumers Co., Reed City, Mich.; H. W. Beckerdite, Cities Service Gas Co., Pampa, Texas; Sam Harris, Anderson-Pritchard Oil Corp., Cyril, Okla.; W. R. Rosenbaum, Arkansas Louisiana Gas Co.; El Dorado, Ark., and D. W. Rhodes, Southern Carbon Co., Monroe, La.

Frank S. Kelly Jr., Shreveport, La., president, Southern Gas Association, addressing the general assembly.

During Wednesday and Thursday morning general sessions papers included: "Fundamental Gas Laws", E. F. Dawson, University of Oklahoma; "Fundamental Principles of Regulators", H. D. Meuffels, Reynolds Gas Regulator Company; "Fundamental Principles of Orifice Meters", C. C. Abbott, Pittsburgh Equitable Meter Company and "Fundamental Principles of Displacement Meters", A. F. Benson, American Meter Co., Inc.

During the afternoon classes approximately 60 subjects were presented and demonstrated, many with the use of measurement and regulator equipment furnished by the University and various manufacturers. About 20 manufacturers had exhibits at the school covering a wide range of up-to-the-minute gas and oil measurement and regulation machines and equipment.

Chief sponsor of the short course, as in former years, was the College of Engineering, University of Oklahoma. The school was assisted by the Corporation Commission of Oklahoma, Railroad Commission of Texas, Kansas Corporation Commission, Arkansas Oil and Gas Commission, Oklahoma Utilities Association, Natural Gas Section, American Gas Association, and Natural Gasoline Association of America.

C. A. Gibson, new chairman; Miss Kate A. Niblack, registration chairman; Earl Kightlinger, general chairman and Dean W. H. Carson, chairman, executive committee, are discussing details of the school.

NEGA Sets 1946 Meeting

The New England Gas Association has announced that the dates of their 1946 annual meetings are March 20, 21 and 22. Clark Belden, executive secretary, states, "This information is presented at this time in the interest of avoiding any conflict in dates."

Home Service Committee Plans 1945 Projects

A two-day meeting of the A.G.A. Home Service Committee was held recently in Chicago to discuss home service committee projects to be prepared as printed reports; problems immediately at hand, such as sub-committee discussions on problems to be developed as future projects; and the promotion in 1945 of the victory garden and food preservation program. Policies affecting the promotion of kitchen planning as it affects home service were also reviewed in a questions and answers feature. Colleen Fowler, home service director of the Kansas City Gas Co., and this year's chairman, presided at the two-day sessions which replaced two of the home service regional work shops originally planned for the work of the committee this year.

Committee projects and the chairmen of each are: A Home Service Training Course Within the Company, Chairman Jeannette Campbell, Minneapolis Gas Light Co.; A Handbook on Home Service for High School and College Students, Chairman, Hulda Ungericht, The Ohio Fuel Gas Co.; Modern Kitchens for Homemaking Instruction, chairman, Ruth Sheldon, Washington Gas Light Co.

INGA To Participate In Natural Gas Investigation

The Board of Directors of the Independent Natural Gas Association of America, at a recent meeting in Tulsa decided to participate in the natural gas investigation by the Federal Power Commission, Charles Orr, Mid-Continent Secretary at Oklahoma City, announced.

E. Buddrus, Association president, wired Basil Manley, FPC chairman, of the decision. The executive committee was directed to employ legal and engineering staffs necessary for properly presenting the case of the industry.

The hearings, which were scheduled to open at Kansas City, May 1, have been delayed until late Summer or early Fall because state conservation commissions were not ready.

Pacific Coast Water Heater Makers to Study Sizing

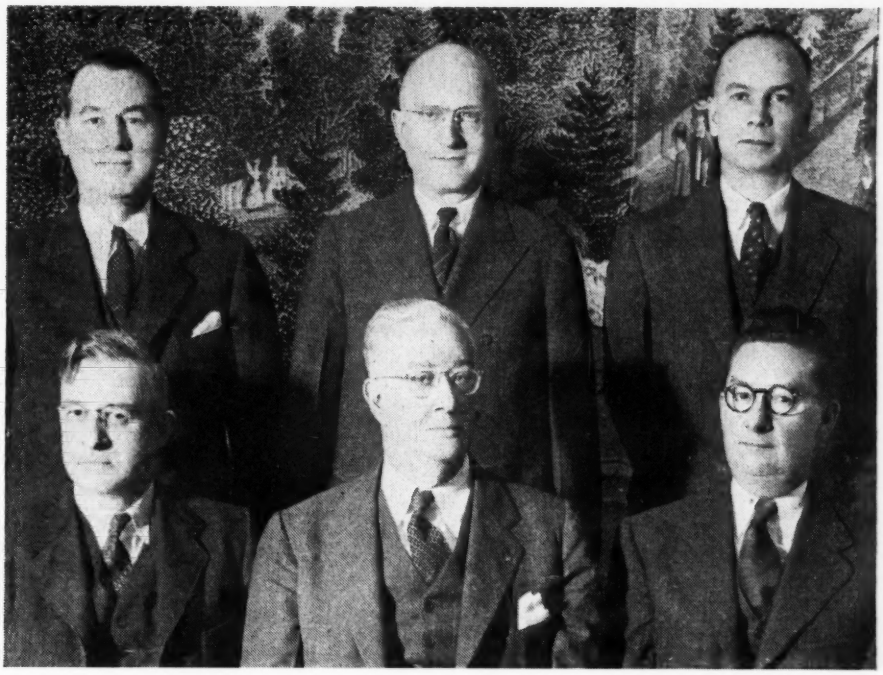
The water heater division of the Manufacturers' Section of the Pacific Coast Gas Association has appointed a committee to take up the problem of proper sizing of water heaters. Clyde Potter, commercial manager, Southern Counties Gas Co. and Claude Ballinger, Republic Heater Corp., are co-chairmen of the committee. Committee members are: Wayne Smith, Continental Heater Co.; A. H. Sutton, Mission Water Heater Corp.; H. W. Geyer, utilization engineer, Southern Counties Gas Co.; and J. E. Kern, general supervisor, Appliance and Dealer Sales, Southern California Gas Co.

AGAEM Water Heater Group Holds Annual Meeting

The water heater division of the Association of Gas Appliance and Equipment Manufacturers held its annual meeting April 11 and 12 in Denver, Colo. Representatives of 21 manufacturers throughout the country were present, seven of these being from the Pacific Coast. Total membership of the division is about 40 members .

Elected to take office in October were: H. E. Handley, general manager, Handley-Brown Heater Co., Jackson. Mich., chairman; W. J. Cartter, vice president, Day and Night Manufacturing Co., Monrovia, Calif., vice chairman.

Two important actions taken at the meeting were the endorsement of contributions by the water heater manufacturers to the A.G.A. advertising and promotion program for 1945, and the adoption of a rule that absent members would be given the privilege of voting by mail on matters to be decided by the group.



NEW ENGLAND GAS ASSOCIATION OFFICERS (1945-46): FRONT ROW (l. to r.) L. E. Knowlton, Providence Gas Co. (first vice president); D. S. Reynolds, Boston Consolidated Gas Co. (incoming president); H. M. Henry, Negea Service Corp., Cambridge retiring president). REAR ROW (l. to r.) E. H. Eacker, Boston Consolidated Gas Co. (treasurer); J. A. Cook, Lynn Gas & Electric Co. (second vice president); Clark Belden, Boston (executive secretary, clerk).

Mid-West Gas Association Elects New Officers

The 40th Annual Meeting of the Mid-West Gas Association, held at Omaha, Neb., early in April, resulted in the election of the following new officers: president, B. R. Bay Northern Natural Gas Co., Omaha; first vice president, E. C. Deane, Central Electric & Gas Co., Sioux Falls, So. Dak.; second vice president, E. J. Otterbein, Iowa-Illinois Gas & Electric Co., Davenport, Iowa; and secretary-treasurer, R. B. Searing, Sioux City, Iowa.

A.G.A. Publishes Clip Sheet On Gas Appliances

The Committee on National Advertising, American Gas Association, announces the publication of clip sheet No. 1, called "News Stories on Gas Appliances". Each of these stories is designed to be used in local newspapers at any time it is convenient or desirable. They may be more effective if released separately at regular intervals in view of the newspaper shortage.

Canadian Ass'n Convention Speakers Announced

Principal speakers at the 38th Annual Convention of the Canadian Gas Association, to be held June 19 to 22nd inclusive at the Monoir Richelieu Hotel, Murray Bay, Quebeck, will be: A. W. Given, vice president in charge of sales, Gurney Foundry Co. Limited, Toronto; H. Vinton Potter, director "New Freedom Gas Kitchen" program, American Gas Association; H. W. Durgy, division supt., Dominion Natural Gas Co., Ltd., St. Catharines, Ont., Chairman of Speakers Committee; George S. Jones, Jr., vice president in charge of sales, Servel Inc., Evansville, Ind.;Raymond M. Conner, director testing laboratories, American Gas Association, Cleveland, Ohio; E. Carl Sorby, vice president George D. Roper Corp., Rockford, Ill.; Miss Jessie Mc Queen, home service counsellor, AGA, New York, and others to be announced.

Pennsylvania Association Holds April Meeting

The Pennsylvania Natural Gas Men's Association met at the Fort Pitt Hotel, Pittsburgh, April 10 to hear Harry A. Strain, director of raw materials, fuel and power, Carnegie-Illinois Steel Corp., give an address.

Lone Star Sponsors New Radio Program

A new radio program is being sponsored by the Lone Star Gas Co., on Station KGKO, Dallas, each Monday, Wednesday and Friday at 1:30 p.m. The program, called "New Freedom Home," is built around that theme and brings out all the advantages of "the house that gas runs"

OPERATING IDEAS

Connecting Regulators

Rapid Method for Shop Testing

From AGA's "Report of Subcommittee on Wrinkles," W. R. FRASER, Michigan Consolidated Gas Co., Detroit, Chairman.

This apparatus was designed for the purpose of connecting service regulators to the high pressure air line and testing them at various rates of flow. The apparatus consists of three parts—

1. A high pressure air inlet on which is placed the regulator inlet.

2. A connection from the regulator outlet to adjust the various rates of flow.

3. A frame with a long screw, which was salvaged from a discarded gate valve and which holds the entire unit tightly in place while testing.

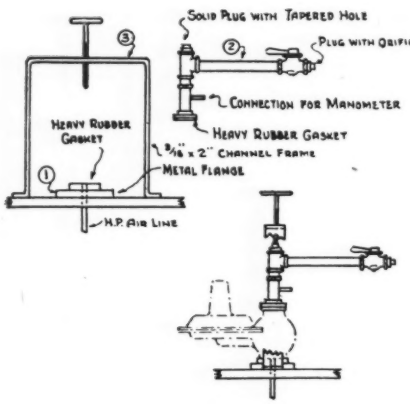


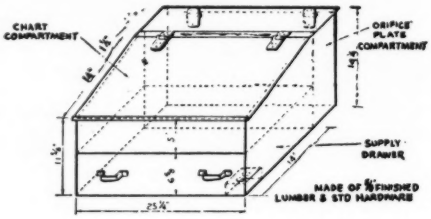
Chart Box

For Use at Orifice Measuring Stations

BARNEY HAWK, Panhandle Eastern Pipe Line Co., Kansas City. Presented before 1944 Wrinkle Class, Southwestern Gas Measurement Short Course, College of Engineering, Oklahoma University, Norman, Okla.

At large orifice measuring stations of Panhandle Eastern Pipe Line Co., spare clocks, orifice plates and recorder pens are left in the chart box so that station tenders and chart changers change these items in case the meter man cannot be reached when a change is needed to maintain proper measurement records.

In such stations a three compartment, desk type chart box is constructed to include storage space for charts and envelopes in the top compartment; ink, blotters, envelopes, recorder pens, clocks, wiping rags, pen cleaners and glass cleaning fluid in the bottom compartment, and orifice plates in the back compartment. The height of the box for the plate compartment is varied according to the size orifice plates used at each station. The drawer of all size boxes must be constant at 5-in. drawer height to accommodate clocks and ink bottles. The box is mounted directly on the building wall, directly on the meter



run or on 2x2 in. supports hinged to the wall of the building and resting upon the runs close to the meters, thus making all supplies convenient for the chart changer, as well as affording a writing desk.

Work schedule, test, inspection and orifice plate record, chart list and address list cards are posted on the inside of the lid for easy reference and posting.

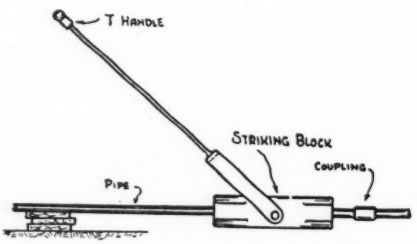
Driving Device

For Small Diameter Services

From AGA's "Report of Subcommittee on Wrinkles," W. R. FRASER, Michigan Consolidated Gas Co., Detroit, Chairman.

This device is used for driving small size services under roadways. Everything is made level and a short length of greased pipe is put on the length to be driven.

Then an iron block bored the size

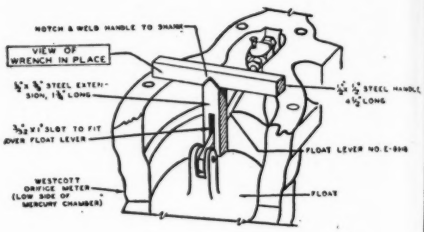


of the service pipe (OD) is slid onto the length of greased pipe, then by means of the T handle that is fastened to the block of iron, the service is driven forward by striking against the coupling.

Alignment Wrench

For Orifice Meter Float Lever

HARRY WILSON, Oklahoma Natural Gas Co., Tulsa. Presented before 1944 Wrinkle Class, Southwestern Gas Measurement Short Course, College of Engineering, Oklahoma University, Norman, Okla.


NOTCH & WELD HANDLE TO SHANK
VIEW OF WRENCH IN PLACE
STEEL HANDLE 4½" LONG
SLOT TO FIT OVER FLOAT LEVER
FLOAT LEVER NO. E-8918
WESTCOTT ORIFICE METER (LOW SIDE OF MERCURY CHAMBER)
FLOAT

This float lever alignment wrench is used as an accessory while tightening the adjustment nuts on the differential float lever. Its use enables the technician to hold the float lever perpendicular to the float and to hold the float itself in the center of the chamber while adjusting and tightening the float lever nuts.

Proper use of this "Wrinkle" guarantees correct positioning of the float and perfect alignment between float and lever.

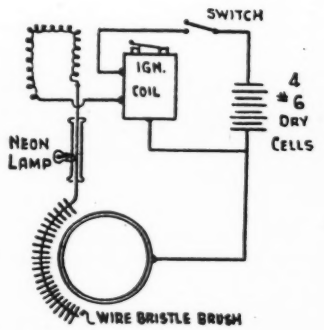
This is a T-shaped wrench with ½x½ in. steel handle 4½ in. long welded to ½x⅝ in. steel shank 1¾ in. long, having 3/32x⅝x1 in. slot at lower end.

Holiday Tester

For Pipe Coatings

From AGA's "Report of Subcommittee on Wrinkles," W. R. FRASER, Michigan Consolidated Gas Co., Detroit, Chairman.

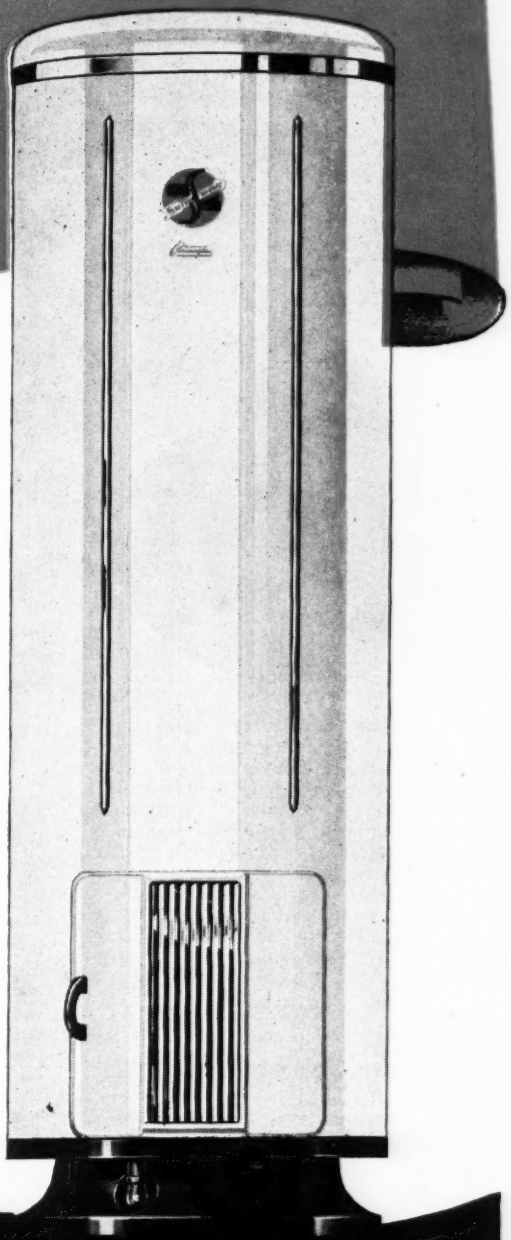
A simple tester to be used for locating faults and voids in dielectric pipe coatings may be made from a Ford Tractor ignition coil, batteries, wire and a wooden brush holder made to



hold a small neon bulb and a wire brush. The circuit is arranged so that when the brush comes in contact with a fault or void as brush is passed over the coated pipes the neon bulb glows brightly, indicating the location of the fault.

23,000 TEST-YEARS *Prove*

THERE IS ONLY *ONE* PERMAGLAS



THE equivalent of 23,000 years of metallurgical and ceramics research was required to perfect SMITHway *Permaglas* for water heater tanks. Just "any glass lining" won't do! There is no way to by-pass the time, patience, scientific knowledge and facilities required to develop the ceramics formulae and the metallurgical processes that have made *Permaglas* possible.

Resistance to thousands of water specimens, and a multiplicity of other time-consuming tests starting way back in 1929, continued for eleven long years before we were ready to offer *Permaglas* to the public.

These are the "hidden values" of *Permaglas* . . . reasons why "there is only ONE *Permaglas,*" the sparkling blue, mirror-smooth, glass-fused-to-steel lining that makes *Permaglas* Gas Automatic Storage Water Heaters the easiest to sell, and the best anyone can buy.

Write for "The Inside Story of *Permaglas*". . . a great aid to sales.

"Heated with Gas, Stored in Glass"

A. O. Smith Corporation,
Dept. G145 H

Please send me a copy of "The Inside Story of *Permaglas.*"

Name.....

Title.....

Company Name.....

City and State.....

SMITHway *Permaglas*
GLASS LINED
TRADE MARK REG. U. S. PAT. OFF.

NEW PRODUCTS

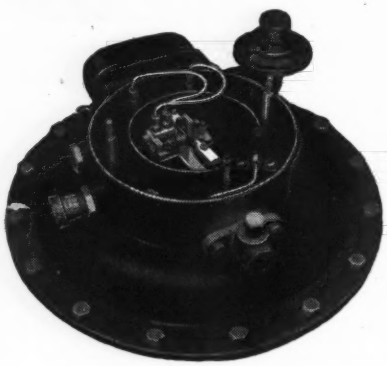
Snap Acting Pilot

Fisher Governor Co., Marshalltown, Iowa.

Model: New Snap Acting Wizard Pilot for on and off pressure control.

Application: Recommended for all applications where two position valve control must have the accuracy and dependability that is characteristic of wizard pilot control.

Description: This pilot is particularly adapted to pressure flowing of flush type oil wells—a service known as



"stop cocking"—operating range flexible to meet all conditions. Also particularly recommended for gas lines where freezing within the valve structure may be overcome by on and off pressure control. Applicable to many other two position control applications.

Available in direct or reverse acting types for diaphragm or remote panel mounting. Snapping range adjustable from 1% to 25% of bourdon tube rating and that range placed anywhere within the tube rating.

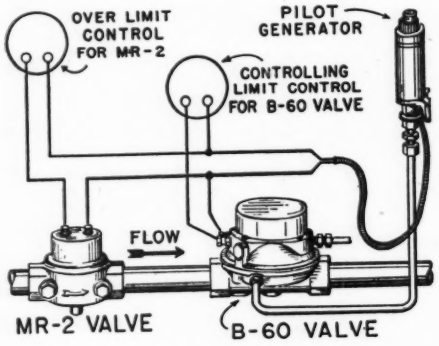
Heating System Control

General Controls Co., 801 Allen Ave., Glendale Calif.

Model: MR-2 Valve.

Application: The installation of this additional control and a manual reset valve safeguards against the hazard of an over-run temperature, which can be costly on many industrial and commercial control systems, such as chicken brooders, water heaters, core ovens, banana room heaters, etc.

Description: To illustrate, if the control system pictured here were on a deep fat fryer, the controlling limit control for the B-60 valve would be set at 380° F. The over-limit control for the MR-2 manual reset valve would be set below the flash point of grease or about 410° F. Then, should pipe scale or dirt lodge underneath the main controlling valve seat, the second shut-off control would prevent the fryer temperature from rising to the flash point. In normal operation, the MR-2 is initially set by hand upon



lighting pilot burner, after which the controlling limit control will turn the B-60 on or off according to heat requirements. Should temperature rise above normal, over-limit control releases the MR-2 until operator can attend to heater.

Temperature Recorder

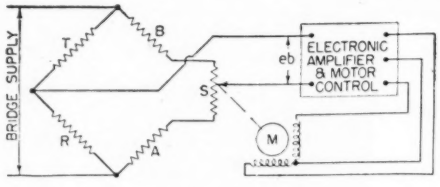
Bailey Meter Co., 1050 Ivanhoe Road, Cleveland.

Model: Electronic Temperature Recorder-Controller.

Application: Used for indicating, recording and controlling temperatures betwen 100°F and 1000°F.

Description: This recorder operates on the null balance principle and provides instantaneous balancing action by electronic detection and control. Unbalance of the measuring bridge is detected by electron tubes without the aid of a galvanometer or other moving parts.

The recorder - controller indicates, records, and controls temperature A 29-in. indicating scale which circles the chart may be read easily at a distance of 50 ft. The pointer reading coincides with that of the recording pen. Indicating, recording and controlling mechanisms are all driven by the same reversible electric motor which adjusts the slidewire resistance to balance the measuring bridge. This motor is continuously connected to the electronic control unit which in turn is continuously connected to the meauring bridge as shown in the sketch.



T=TEMPERATURE SENSITIVE PLATINUM RESISTANCE
A,B & R=FIXED RESISTORS M=SLIDEWIRE DRIVE MOTOR
S=SLIDEWIRE

Measuring circuit for Bailey Electronic Temperature Recorder-Controller.

The unit may be provided with as many as four recording pens, each one being provided with its own continuously connected electronic control unit and measuring bridge. This feature insures instantaneous response to changes in temperature.

The temperature sensitive element is a platinum resistance wire, wound on a mica form and held between two mica sheets which are clamped by a metal frame. The element is further protected by a well which is permanently installed in the pipe line, furnace wall, duct, or other point of temperature measurement. The temperature element is diagrammatically represented in the sketch by the resistor T. Resistors R, A and B are fixed and are designed to provide proper range of measurement. Adjustment of the slidewire contact on the resistor S subtracts resistance from A and adds resistance to B or vice versa. Thus, the bridge is balanced by adjusting the ratio of the bridge arms and the necessity of carrying bridge current through the slidewire contact is avoided. Variations in contact resistance are thus prevented from affecting calibration.

Since alternating current is used for the bridge, no battery source of bridge voltage is needed. Standard voltage cells and voltage standardization equipment are not required.

Catalogs

• **The Cochrane Corp.** 17th and Allegheny Ave., Philadelphia 32, describes and illustrates the Cochrane tilting U-Tube mechanical type meter in their Publication 3010-31, which may be obtained upon request to the company. Three fundamental features are incorporated in this high torque mechanical meter: (1) Flow measurement by response to difference in pressure by a mercury seal in a U-tube; (2) weighing mass by means of a beam balance; (3) the use of torsion tubes as the scientific solution of the stuffing box problem.

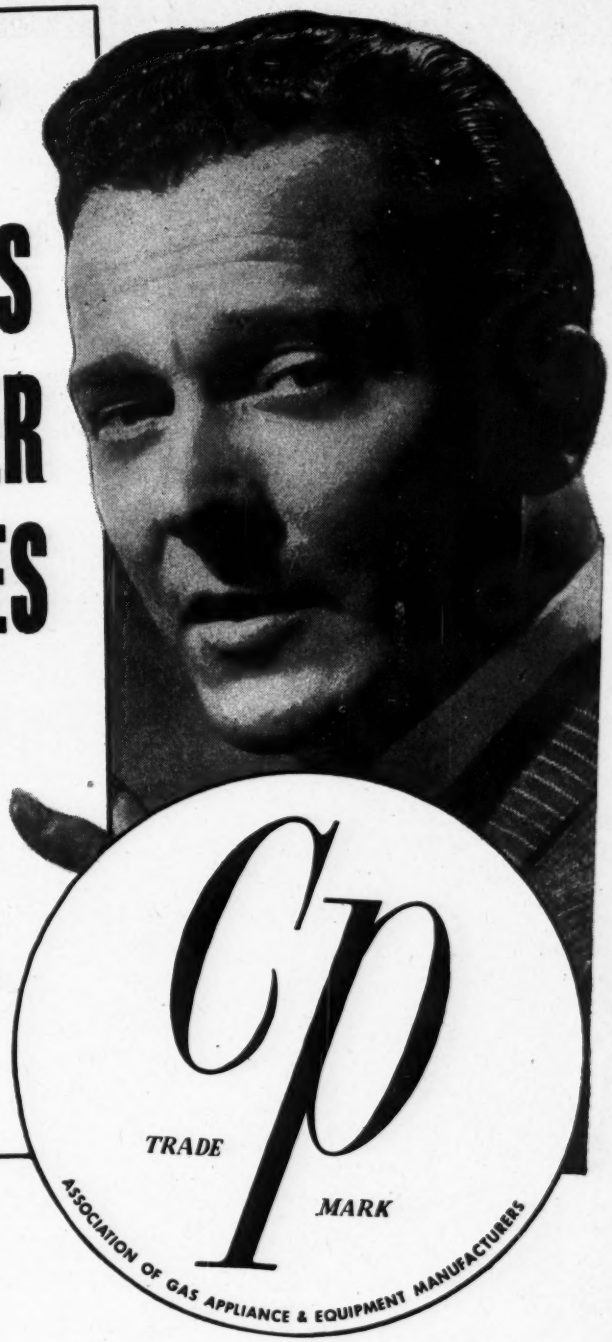
• **Roots-Connersville Blower Corp.**, Connersville, Ind. has issued a new four-page general bulletin, No. G-81-D, covering its rotary positive blowers and gas pumps, centrifugal blowers and exhausters, rotary positive vacuum and liquid pumps, rotary displacement gas and liquid meters, and inert gas generators. The folder is illustrated and typical installation views are shown covering the principal applications of Roots-Connersville equipment. Copies of the bulletin are available on request to the main office or any branch.

• **Minneapolis-Honeywell Regulator Co.** 2720 Fourth Ave. South, Minneapolis 8, Minn., has published a booklet entitled, "Heating and Air Conditioning the Postwar Home." It explains their Moduflow System of distributing heat to the various parts of the house, in such a way that each part is warmed in accordance with its individual needs.

• **Fischer & Porter Co.**, Hatboro, Pa., has issued a bulletin, (No. 92-C), describing their new "Rotasight Flow Rate Indicator." In requesting copies write for Bulletin 92-C, Fischer & Porter Co., 9-40 County Line Road, Hatboro, Pa.

THESE 20 MANUFACTURERS ARE HELPING YOU TO

SELL YOUR DEALERS ON SELLING HIGHER GRADE GAS RANGES



A-B STOVES, INC.
AMERICAN STOVE CO.
CALORIC GAS STOVE WORKS
CRIBBEN & SEXTON CO.
DETROIT-MICHIGAN STOVE CO.
THE ESTATE STOVE CO.
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THE TAPPAN STOVE CO.
WESTERN STOVE CO., INC.
In Canada: CLARE BROS. & CO., LTD.
GURNEY FOUNDRY CO., LTD.
MOFFATS, LTD.

cp

TRADE MARK

ASSOCIATION OF GAS APPLIANCE & EQUIPMENT MANUFACTURERS

TIE-IN TO THIS BIG NATIONAL INDUSTRY-WIDE PROGRAM NOW

IN A comprehensive list of eighteen trade papers, 'CP' manufacturers are telling the story of 'CP' and gas for cooking, to every important electrical and gas appliance dealer, department store, furniture store, hardware store, architect, builder, and home economist.

In addition, these 20 manufacturers are featuring 'CP' in their own national advertising — reaching millions of homemakers each month.

Inquiries are pouring in for the 'CP' cook book and for the 'CP' dealer kit, ready soon.

Ready for you *now,* for circularizing your dealers, are proofs of these effective 'CP' advertisements. Ready as soon as war conditions permit, will be a complete comprehensive program for selling your customers and your dealers. They are waiting to know what you will have for them after the war. It's time to tell them now.

For samples of 'CP' advertising, to use in multiplying the effectiveness of this promotion among your dealers, *write today to Association of Gas Appliance and Equipment Manufacturers, 60 East 42nd Street, New York 17, N. Y.*

GAS—THE WONDER FLAME FOR MATCH-LESS COOKING

Minneapolis-Honeywell Offers Heating School

MINNEAPOLIS-Honeywell Regulator Co., Minneapolis, through Vice President Arnold Michelson, has announced the opening on May 1 of a nationwide school on automatic heating, which has as its primary purpose to teach the application of automatic controls and their installation and maintenance in connection with all types of heating systems using all kinds of fuel. The school, in preparation for more than a year, will be open to dealers, wholesalers, manufacturers, vocational schools, electricians, steamfitters, sheet metal workers and any others interested in heating. There will be no charge for those attending.

The company, in planning the course, had also in mind the rehabilitation of men of the armed forces who, by prior experience, or by choice, want to find jobs in some phase of the heating industry, Michelson said. "There is a real need for an integrated educational program in the automatic heating industry right now, and we believe all of those in the field will be anxious to catch up with new developments and learn proper installation and service methods."

The course will be held in all sections of the United States where company branches are maintained, and when a sufficient number of people indicate a desire to enroll. Prepared by Honeywell technicians in cooperation with a company specializing in visual education, the complete course extends for four 2½-hour meetings. More than 800 slides, many of them in color, are used, while simple but complete lectures fill in the details. The schools will be conducted by company sales-engineers who have been specially trained for the purpose. In all, Michelson said, there are 21 complete sets of material so that 21 schools can be run in various parts of the country simultaneously.

The information to be covered has been divided into 19 subjects with plans to cover several phases in each meeting. Subjects to be discussed are: control identification, circuits, thermostats, thermostat installation, limit controls, relays, controls for oil burners, summer-winter systems, oil burner systems, gas burner control systems, stoker systems, hand-fired systems, unit heater systems, zone controls, weatherstat systems, moduflow, and installation helps and service tips.

Enrollment cards for the courses are available from wholesalers, utilities, manufacturers, trade and vocational schools and other organizations in the industry.

"CLEVELANDS"—
*Plenty Tough!
*Easy To Handle!
*PLENTY TOUGH . . . *EASY TO HANDLE
•Ample Power { GAS DIESEL
•Strongest Steels
•Proved Design
•Proper Balance
•Simplified Steering
•Wide Graduated Speed Range
USE "CLEVELANDS" ON ALL YOUR JOBS
TOUGH OR NORMAL . . . LARGE OR SMALL
Write NOW for details
THE CLEVELAND TRENCHER COMPANY
20100 ST. CLAIR AVE.
"Pioneer of the Small Trencher"
CLEVELAND, OHIO
"CLEVELANDS" Save More . . . Because they Do More

Safety Record Established By Pittsburgh Companies

Approximately 200 employees of the Manufacturers Light and Heat Co. and its associate, the Natural Gas Co. of West Virginia, have recently passed the twenty-ninth month mark of continuous work without suffering any disabling injuries. This announcement was made by W. H. Adams, safety director of the Pittsburgh group of companies of the Columbia Gas & Electric Corp. From Nov. 6, 1942 through April 6, 1945, almost 1,000,000 man-hours of work on the part of these public utility employees have been free from disabling injuries.

Contractors Prefer Gas Heat Building Survey Reveals

According to the results of a recent survey conducted by **Practical Builder** magazine among 5000 building contractors in 29 states, 85.1% of the contractors said they were personally responsible for determining the type of heating system that goes into 50% or more of the homes they build, or contract to build, and stated that their preference was gas heat. Over half of the builders (57.6%) said they would use gas heat in 50% or more of the homes they build; oil heating systems were preferred by one-fourth of the builders (25.1%); hand-fired coal heating by 16.1%; and stokers by 9.1%.

Consider---

WEBSTER BURNERS *and* CONTROLS

There are Webster Burners and Controls for every type of boiler and all gas pressures, that will produce maximum combustion efficiency at lowest operating cost within their range and size. The variety of standard types and sizes of Webster Burners provides all the advantages of specially engineered equipment at low installation cost.

Webster engineers are quickly available. They can recommend the proper type of burner for the job — Satisfaction is guaranteed from each installation of Webster Burners and control equipment.

•

Represented by:

FEDERAL SUPPLY CO.....Oklahoma City, Okla.
CATLETT ENGINEERS.....Dallas, Texas
F. J. EVANS ENGINEERING CO.....Birmingham, Ala.
F. P. FISCHER ENGINEERING CO.....New Orleans, La.
F. J. EVANS ENGINEERING CO.....Houston, Texas
E. G. LANGHAMMER CO.....San Antonio, Texas
SNOOK & ADERTON.....Amarillo, Texas
NATURAL GAS EQUIPMENT CO.
.....Los Angeles and San Francisco
ALL SURFACE COMBUSTION OFFICES

•

THE WEBSTER ENGINEERING COMPANY . . TULSA, OKLA.

Division of SURFACE COMBUSTION - - - - - - Toledo, Ohio

Automotive Fleet Training Courses Announced

THE National Committee on Automotive Fleet Supervisor Training of the Automotive Safety Foundation, Tower Building, Washington, D. C., recently announced the scheduling of 12 additional fleet supervisor training courses to be given during 1945 in as many universities in cooperation with national, state and local organizations interested in safety and conservation. Four such courses have already been held this year at Ohio State University, North Carolina State College, Tulane University (La.), and Texas Agricultural and Mechanical College, in which 163 supervisors participated. The number of drivers reached by these supervisors totaled 22,155.

Arrangements for the 12 additional courses are as follows:

Northwestern University, Evanston, Ill., (May 21-26).

Washington University, St. Louis, Mo., (May 28-June 1).

University of Denver, Denver, Colo., (June 25-29).

University of Washington, Seattle, Wash., (July 9-13).

Oregon State College, Portland, Ore., (July 16-20).

University of California, Berkeley, Calif., (July 23-27).

University of Southern California, Los Angeles, Calif., (July 30-Aug. 3).

Iowa State College, Ames, Iowa, (Aug. 20-24).

The Pennsylvania State College, State College, Pa., (Sept. 10-14).

Georgia Institute of Technology, Atlanta, Ga., (Oct. 22-26).

New York University, New York, N. Y., (Oct. 29-Nov. 2).

Purdue University, Lafayette, Ind., (Nov. 5-9).

NO FRICTION!
means . . .
GREATER ACCURACY
QUICKER READINGS
NO LEAKAGE
ARCCO-ANUBIS LIQUID
GRAVITOMETERS
contain no moving joints or stuffing boxes, eliminating friction and leakage. They record specific gravity of liquids under the actual line pressure of a continuously flowing sample . . . and record changes at almost the exact instant they occur. Temperature compensated — readings are automatically corrected to read as of 60° F. or other predetermined temperature, regardless of actual line temperature. Hundreds of these precision-built instruments are in continuous use under all conditions, giving accurate readings in the refineries and pipe lines of major companies.
SEND FOR NEW BULLETIN NO. 111 A
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. Los Angeles 23, Calif.
SEND FOR COMPLETE LIST OF ARCCO CHARTS

Consolidated Natural Lists 1945 Construction Expense

According to Consolidated Natural Gas Co.'s annual report for 1944, it is expected that the System's expenditures for construction in 1945 will be in the nature of replacements or rearrangements. Some of the major items of the budget are as follows:

The Hope Natural Gas Co., proposes to modernize its natural gasoline extration plant at Hastings, W. Va., and to increase its production of butane and propane. This company will add spare compressors at its Cornwell station to assure its ability to operate at capacity at all times.

The Peoples Natural Gas Co., Pittsburgh, is installing a new steam boiler plant at its Brave compressor station to replace existing boilers which have been in constant service since 1906.

The East Ohio Gas Co. will lay such pipelines in Cleveland as may prove to be necessary to replace the loss of use of the liquid storage plant. It is also erecting modern buildings needed to replace the shops, warehouses and offices lost in the fire.

Amer. Engineering Acquires Cochrane and Faraday Corps.

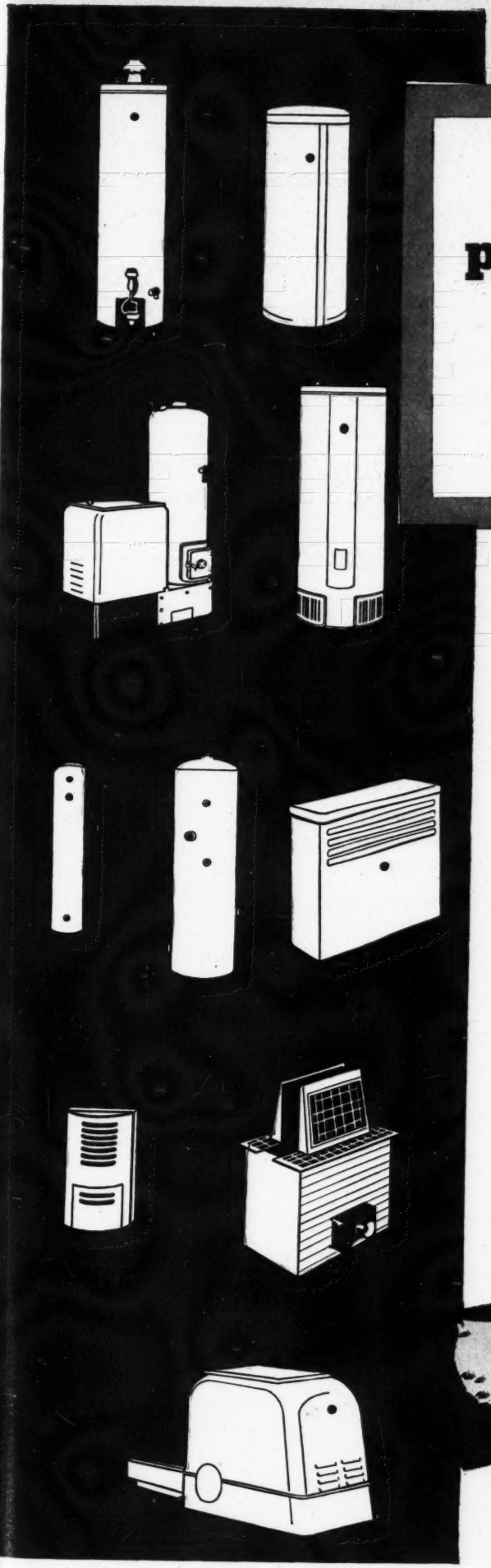
American Engineering Co. has concluded negotiations for the acquisition of the entire outstanding stock of Cochrane Corp., Philadelphia, and Faraday Electric Corp., Adrian, Mich. Faraday manufactures electric signalling devices and specialized electrical household appliances, and Cochrane produces various products used in industrial and power plant equipment fields.

Percy S. Lyon will continue to service as president and director of the Cochrane Corp., and will become a director of American Engineering.

Carthage Cycling Plant to Be Built by United Gas Corp.

United Gas Corp., has started construction of a cycling plant in the Carthage field, near Carthage, Tex. The plant will have a daily capacity of 50,000,000 cu. ft. of natural gas and will cost around $7,000,000.

The company will construct a gathering line in the field in order to serve the plant. A 24-in., 140-mile line will be built from the plant to Monroe, La., where connection will be made with the system of Tennessee Gas & Transmission Co.



There's a big post-war opportunity for you with RHEEM

When RHEEM swings over from wartime to peacetime production, its post-war products will offer a growing market—an opportunity for growing profits.

The Rheem line will include a group of better water heaters for all types of fuels—gas, liquid gas, electricity, oil and coal; floor and wall furnaces; consoles and other space-heating equipment; Stokermatic coal stokers and stoker-fired furnaces; range boilers and tanks of all kinds—new appliances for better living. They all represent opportunities for a great business-building future.

Just now, Rheem production is concentrated on material for our fighting forces. Rheem is busy making dozens of precision-built war products, from airplane parts to 8-inch artillery shells. Rheem shipping containers, by the millions, are carrying supplies to the war fronts. Rheem water heaters, range boilers and tanks are going into wartime housing.

When Victory comes, Rheem will have unexcelled manufacturing and research facilities . . . will focus its experience on volume production of quality-built household appliances. The Rheem line offers real opportunity for a business-building future.

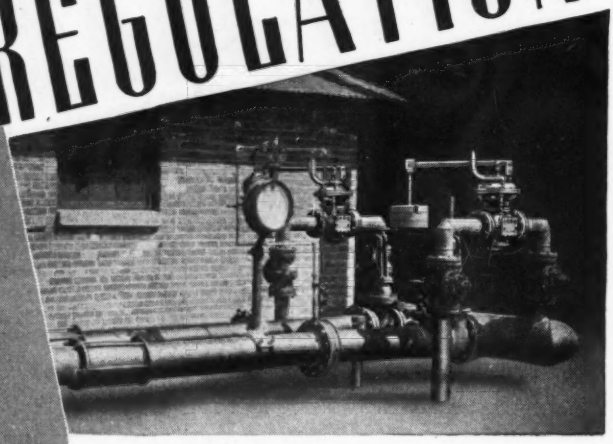
In Your Plans for the Future . . . include Rheem

RHEEM MANUFACTURING COMPANY

Executive and General Sales Offices
New York • San Francisco • Los Angeles
Chicago • Washington, D.C.

15 Plants Cover Every Major Market in the U.S.A.
3 Plants Serve Australia

GAS REGULATION



BY REYNOLDS

Reynolds builds a Regulator for every type of Gas Control. Long life, efficient operation, accurate regulation, reasonable cost, low upkeep — all of these are vitally important features built into Reynolds Gas Regulators. Reynolds is proud of its leadership through more than half a century of service. Our Engineering Department will gladly work with you to solve your Gas Control problems. Write.

★

BRANCH OFFICES:
423 Dwight Bldg., Kansas City, Missouri
2nd Unit, Sante Fe Bldg., Dallas, Texas

REPRESENTATIVES:
Eastern Appliance Company
Boston, Massachusetts
Wm. A. Ehlers, No. 268 Park St.
Upper Montclair, New Jersey

Gas Control since 1892

REYNOLDS GAS REGULATOR CO.
ANDERSON, INDIANA, U. S. A.

Peoples Natural Gas Co. to Acquire Penelec Properties

EFFECTIVE June 30, the Peoples Natural Gas Co. will take over from the Pennsylvania Electric Co., the sale and distribution of natural gas to 18,500 users in Johnstown and vicinity. Penelec disposed of its franchise and physical properties—gas mains and other facilities—to the Pittsburgh firm for approximately $1,200,000 cash, according to an announcement by Philip H. Harris, president of Penelec, and Edward M. Borger, president of Peoples.

While Peoples negotiates such details as establishment of a commercial office and coordination of operating and maintenance personnel on transfer from Penelec, billings will be made by Penelec and all collections and customer contacts will be handled at Penelec's office. Penelec's withdrawal as applying to billing and other details will be completed within 60 days of the June 30 closing date.

Colin U. Miller will be retained by Peoples as superintendent, a post he filled in Penelec's gas department. Penelec employees in the gas department likewise, number about 37, will be offered similar employment by Peoples with the exceptions that Penelec will retain portions of the meter-reading group and maintenance and service personnel who work jointly in the gas and steam heating departments.

Penelec has furnished natural gas, purchased from the Peoples Natural Gas Co. and piped from wells in western Pennsylvania and West Virginia, to consumers in Johnstown, Dale, Westmont, Southmont, Lorain and Ferndale. Peoples has been supplying the gas requirements of Penelec and its predecessors since 1907, when a plant on Broad Street for the manufacture of gas was abandoned. Natural gas could be produced more cheaply than it could be manufactured and was sold at less cost.

To obtain its requirements, Peoples draws on the output of its own wells in 11 counties in western Pennsylvania and secures part of its needs from independent producers and the Hope Natural Gas Co., which has extensive operations throughout West Virginia. Peoples was acquired by the Consolidated Natural Gas Co. System from the Standard Oil Co. in 1943, along with the New York State Natural Gas Co., Hope Natural Gas Co., East Ohio Gas Co., and the River Natural Gas Co.

Portland Utility States Postwar Sales Policies to Its 250 Dealers

Portland (Ore.) Gas & Coke Co. is distributing to 250 furniture store, appliance and plumber dealers in its operating area a statement of sales policies which will determine in general the utility's postwar activities in the field of gas appliance merchandising.

Dealer coordinators are delivering and reviewing with their dealers the policy statement which is reproduced on a sheet of heavy paper suitable for posting and ready reference. The personally delivered letter of transmittal is signed by R. G. Barnett, vice president and general manager.

While thus placing their company's cards on the table, the coordinators also are using the opportunity of the interviews to ask dealers a few pertinent questions regarding their postwar thoughts and plans. The results, when compiled, are expected to be of great help in working out final phases of the postwar dealer cooperative merchandising program.

To put its basic intentions on record, the utility used the statement of sales policies composed in cooperation with the National Retail Furniture Association, Gas Appliance Societies and other retail trade groups, and which was recommended by the executive board of the American Gas Association.

Air Conditioning Division Formed by Westinghouse

According to a recent announcement, the Westinghouse Electric Elevator Co. is being dissolved as a corporate entity and the activities formerly handled by the Elevator Company, which was a wholly-owned subsidiary of the Westinghouse Electric and Manufacturing Co., will continue as the Elevator and Air Conditioning divisions of Westinghouse.

The election of Ellis L. Spray by the board of directors as a vice president of Westinghouse, in charge of the elevator and air conditioning activities of the company at Jersey City, N. J., was announced at the same time, by A. W. Robertson, chairman. Until election to his new post, Spray had been vice president and general manager of the Elevator Co.

PLAN AHEAD FOR 194X LIVING...

Settle these Questions
for Complete Comfort and Lasting Satisfaction

What type of gas furnace is best fitted to your home heating demands? How will your gas heating equipment cope with unusually cold weather? Where will the furnace registers and cold air returns be placed? And will furniture placement be affected by the heat outlets in the home?

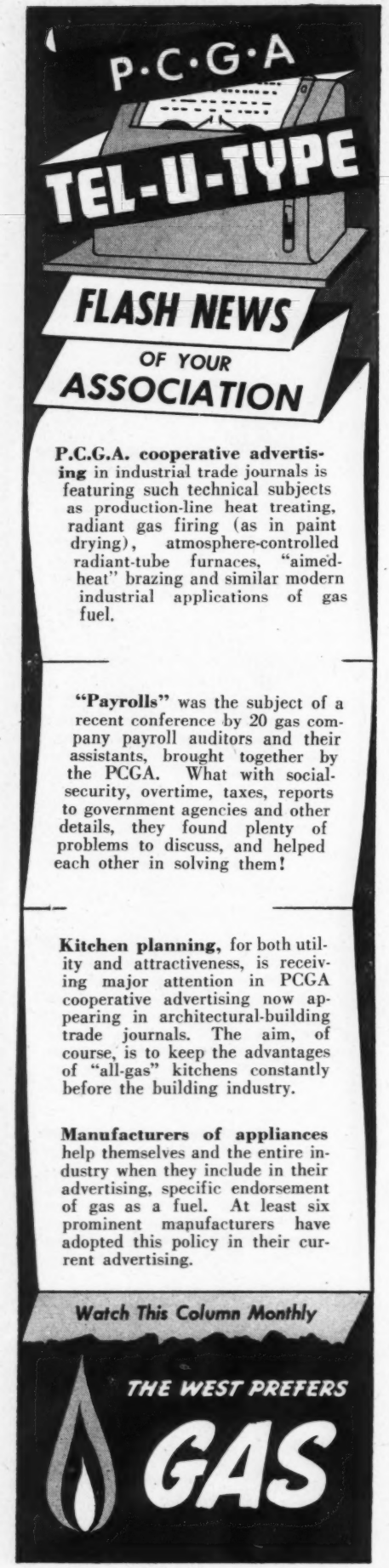
Yes, it pays to plan your heating system in the home carefully. Such careful planning can eliminate chances of discomfort and at the same time give you heating that is a perfect job to live with and costs less to use.

Before you plan your new home too definitely or remodel your present one, be sure to read and clip magazine articles and booklets about combination furnace-playrooms, and the blower-type gas furnace that fits compactly in closets or in the attic. When these new and better appliances become available, your heating contractor will be able to supply you. He can also help you with your planning.

P·G·and·E· PACIFIC GAS AND ELECTRIC COMPANY

FOR POSTWAR BUYING
One of a series of ads published in 32 daily and 127 weekly newspapers of Northern and Central California.

G-205-545


P·C·G·A
TEL-U-TYPE
FLASH NEWS
OF YOUR
ASSOCIATION
P.C.G.A. cooperative advertising in industrial trade journals is featuring such technical subjects as production-line heat treating, radiant gas firing (as in paint drying), atmosphere-controlled radiant-tube furnaces, "aimed-heat" brazing and similar modern industrial applications of gas fuel.
"Payrolls" was the subject of a recent conference by 20 gas company payroll auditors and their assistants, brought together by the PCGA. What with social-security, overtime, taxes, reports to government agencies and other details, they found plenty of problems to discuss, and helped each other in solving them!
Kitchen planning, for both utility and attractiveness, is receiving major attention in PCGA cooperative advertising now appearing in architectural-building trade journals. The aim, of course, is to keep the advantages of "all-gas" kitchens constantly before the building industry.
Manufacturers of appliances help themselves and the entire industry when they include in their advertising, specific endorsement of gas as a fuel. At least six prominent manufacturers have adopted this policy in their current advertising.
Watch This Column Monthly
THE WEST PREFERS
GAS

Skelly Oil to Develop Natural Gas Properties

Outstanding development of its natural gas properties was reported by Skelly Oil Co., Tulsa, Okla., in its annual report for 1944.

In the report, it was stated that, "In the new Panola county, Texas (Carthage) field where exploratory drilling has been resumed in one of the outstanding developments of the year in natural gas and distillate, the company has acquired nearly 100,000 acres—a major part of which can now be considered as proved and highly prospective. . .

"The county also has begun development of its extensive gas holdings embracing approximately 90,000 acres in the Hugoton field, which lies across the Oklahoma Panhandle and reaches into the adjoining states of Kansas and Texas."

Officials previously reported that a program of drilling 30 gas wells in the Carthage field has been mapped by the company and associates. The Chicago Corporation also plans to erect a gasoline plant in the field.

California Utilities Fete Architects and Builders

In order to renew contacts with the architects and building contractors of Southern California and to pass on to them the word about postwar gas appliances and gas air conditioning, the Southern California and Southern Counties Gas Companies, Los Angeles, sponsored two dinner meetings for the groups on April 24 and 25. J. L. Hall, general supervisor, residential gas sales, Southern California Gas Co., acted as master of ceremonies at the meetings which drew a combined attendance of 325.

Principal speakers at both meetings were J. K. Knighton, manager of Servel's air conditioning department, who described the operation, functions, and market potential of his company's summer-winter domestic air conditioning unit, and W. M. Jacobs, manager, general sales, Southern California Gas Co., who talked on postwar appliances.

The first meeting with an attendance of 170 brought together the principal practicing architects in Southern California; the second meeting, held at the Biltmore Hotel for the contractors, had an attendance of 250.

Domestic Research Meetings Scheduled for May, June

Local Domestic Gas Research Conferences will be held in three cities this spring instead of the national type formerly held, according to F. M. Banks, chairman, Committee on Domestic Gas Research, American Gas Association. This change is necessary to comply with regulations of the ODT which limits out-of-town attendance to not over 50 persons. The local conferences have been specifically authorized by the executive board.

The three local conferences will be held in Cleveland, Hotel Statler, May 8 and 9; New York, Hotel Pennsylvania, May 23 and 24; and Chicago, June 6 and 7. The objective of the conferences is to present to appliance manufacturers the results of research conducted under the committee's auspices that cannot be covered in reports or bulletins, and to provide manufacturers, engineers and designers opportunity to analyze and discuss technical material and to question members of the Laboratories' staff who are conducting the various research projects.

Panel sessions devoted to gas cooking research, gas water heating research, and gas house heating research will be held each day. These will be conducted by the Technical Advisory Subcommittees headed by Paul R. Tappan, L. R. Mendelson and Keith T. Davis. Sessions devoted to recent technical developments in gas burners will be featured, as will the technical features of kitchen ventilation.

Invitations have been extended by the Committee on Domestic Gas Research to appliance manufacturer companies beyond commuting areas of the cities, in accordance with ODT regulations.

The Technical Advisory Subcommittees for Gas Water Heating Research and for Central Space Heating Research met at Hotel Statler, Cleveland, on May 7, the day before the conference and the Technical Advisory Subcommittee for Gas Cooking Research met at the A.G.A. Laboratories on May 10 the day following the conference.

Marcy L. Sperry (right), president of the Washington (.D.C.) Gas Light Co. and chairman of the Utilities Section of the District of Columbia War Finance Committee presents President C. Bedell Monro of Pennsylvania-Central Airlines with one of the photos and copy of the plaque that rides in the fighter bomber purchased by PCA employees during the recent Sixth War Loan drive.

Quick Range Turnover In New Orleans

Because of quick range turnover many retailers in New Orleans are enjoying a noticeable increase in business despite wartime handicaps, according to **"Retailing Home Furnishings."** Better quality ranges have by far the greater demand with $129.50 models offering the greatest volume in sales by a ratio of approximately four to one. "Shipments of seven and eight ranges usually arrive at once and are gone within a few days" is the statement of one dealer.

New peacetime load... with RUUD-MONEL

War experience has built a new public appreciation of automatic hot water.

A turn-the-faucet hot water supply is decidedly a wanted service... one that is high up on virtually every consumer-preference appliance survey.

No crystal ball is needed to predict a tremendous peacetime market... or that *GAS* holds the inside track to win it.

Such an opportunity calls for careful water heater selection. And it warrants a close, thorough study of the NEW Ruud Automatic Gas Water Heater with its *solid*, rust-free, long-lived Monel Tank.

In terms of utility and dealer sales... and in terms of public endorsement... the prewar Ruud-Monel was a brilliant success. When war took Monel from civilian use, the technical service departments of Ruud and The International Nickel Company continued their unceasing research in product improvement.

That's why your *next* Ruud-Monel will be better in many ways. In quality, for example... and in performance and appearance. Effective national advertising and promotion will also play important parts in making Ruud-Monel your peacetime load builder... and a fit selling companion of *GAS*, the Wonder Flame.

RUUD MANUFACTURING CO., PITTSBURGH 1, PA.

H_2OT STUFF

★ Seabee Herman A. Teague of Beverly Hills, Cal., took a Monel fishline to the South Pacific... but he didn't catch any fish with it.

When his comrades began losing identification tags because metal wires corroded and broke, Herman knew the ideal solution. He cut his line into short lengths, passed them around. Tags are safe now, for Monel is rustproof and highly resistant to corrosion... even in the tropics. The tags, incidentally, are themselves made of Monel.

★ The first Ruud Automatic Gas Water Heater was built in 1889. Today, Ruud equipment serves throughout the world ... in homes, and in commercial and industrial buildings... wherever hot water is needed.

★ Because Monel combines strength, toughness and corrosion resistance, this well-known metal finds many war uses. Vital parts of ships, submarines, guns and planes are made of Monel. After victory, Monel will again join with Ruud to provide the finest automatic hot water equipment you ever sold.

RUUD
GAS
MONEL ... perfect partners for
Automatic Hot Water Service

Mid-Continent Carbon Plants Get AA-1 Priority

The Mid-Continent oil and gas area plays a large part in the carbon black expansion program of the WPB which has announced new facilities for 198,-100,000 lbs. a year.

The new facilities have been given an AA-1 priority. They will be located in Oklahoma, Texas, Kansas, Louisiana and New Mexico. Companies which will participate in the expansion program include, the Cabot Carbon Co., Charles Enu Johnson, Cities Service Oil Co., Columbian Carbon Co., Phillips Petroleum Co., United Carbon Co., Continental Carbon Co., Jefferson Lake Sulphur Co., and Roxboro Steel Co.

Among the largest of the new facilities scheduled to be completed this year are those of the Cabot Carbon Co., at McCoy La., $1,040,000, same company at Borger, Texas $801,666; Charles Enu Johnson, at Eunice N. M., $2,825,-000; United Carbon Co., at Ryus, Kans., $1,105,748, a new facility and new addition of $1,248,420, same company, at Odessa, Texas $1,135,200.

The Columbian Carbon Co., has applied to the Kansas Corporation Commission for authority to construct a carbon black plant five miles south of Hickok, in Grant County, to use approximately 15,000,000 cu. ft. of gas daily from the huge sweet gas field. The company will also construct facilities at Seagraves, Texas.

Lack of sufficient carbon black production has been the principal factor in retarding the output of synthetic rubber for tires. The WPB reports that output of carbon black must be increased 64% before the rubber manufacturing industry can realize production schedules now planned.

San Diego Load Increases Despite War Cutbacks

Despite war plant contract terminations and cutbacks in San Diego, gas customers of the San Diego Gas & Electric Co. continue to increase, Hance H. Cleland reported as he was re-elected president for the fourth consecutive year at the annual meeting of directors and stockholders April 24.

He attributed the companys net gain in customers, despite declining payrolls of San Diego's largest industry, Consolidated Vultee Aircraft Corp., to increased civilian employment at the Naval Repair Base and the Naval Air Station here. Cleland predicted a temporary drop in revenues following the war's end, but added that this would eventually be overcome by pent-up tourist business, increased permanent naval payrolls and new industrial enterprises.

Cleland reported that although the utility's earnings during 1944 were $2,-000,000 over 1943, increased taxes and operating expenses had actually reduced the net gain $53,111.03, from $193,788.71 to $140,677.68.

Sale of new securities has been unnecessary since 1941, the company electing to finance its wartime expansion out of its cash and other reserves, thus strengthening its financial condition and capital setup.

El Paso Natural Gas Co. To Recover Wasted Gas

The FPC has issued a certificate permitting the El Paso (Tex.) Natural Gas Co., to install and operate facilities in Lea County, N. M. designed to increase its recovery of wasted residue gas from 76,000,000 cu. ft. per day to 96,000,000 cu. ft.

Facilities authorized include 31.5 miles of 16-in. natural gas pipeline beginning at El Paso's Eunice compressor station in Lea County and extending south to the company's Jal Plant No. 1. The certificate also authorized the company to construct and operate five 800-hp. gas compressor units and two 175-kilowatt gas engine driven generators at the Eunice station; to construct and operate two 24-in. scrubbing towers of 13,000,000 cu. ft. daily capacity at the Eunice station; and to construct and operate two 24-in. scrubbing towers of 26,000,000 cu. ft. daily capacity at the Jal plant.

This will enable El Paso Natural to deliver into its pipelines 20,000,000 cu. ft. per day of hitherto wasted gas, thus permitting conservation of an equal volume of gas that it is daily withdrawing from its reserves. The company has been obtaining 76,000,000 cu. ft. per day of residue gas, including 34,-000,000 ft. from Phillips Petroleum Co. The additional 20,000,000 ft. will be supplied by Warren Petroleum Co.

Johns-Manville

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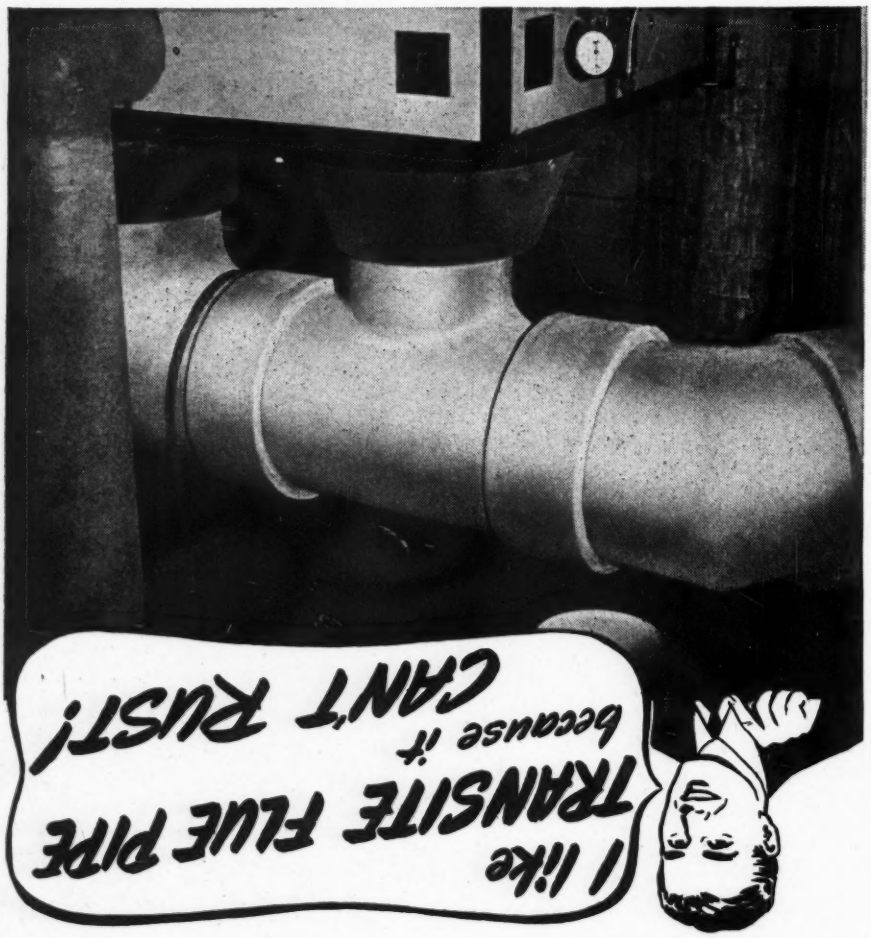
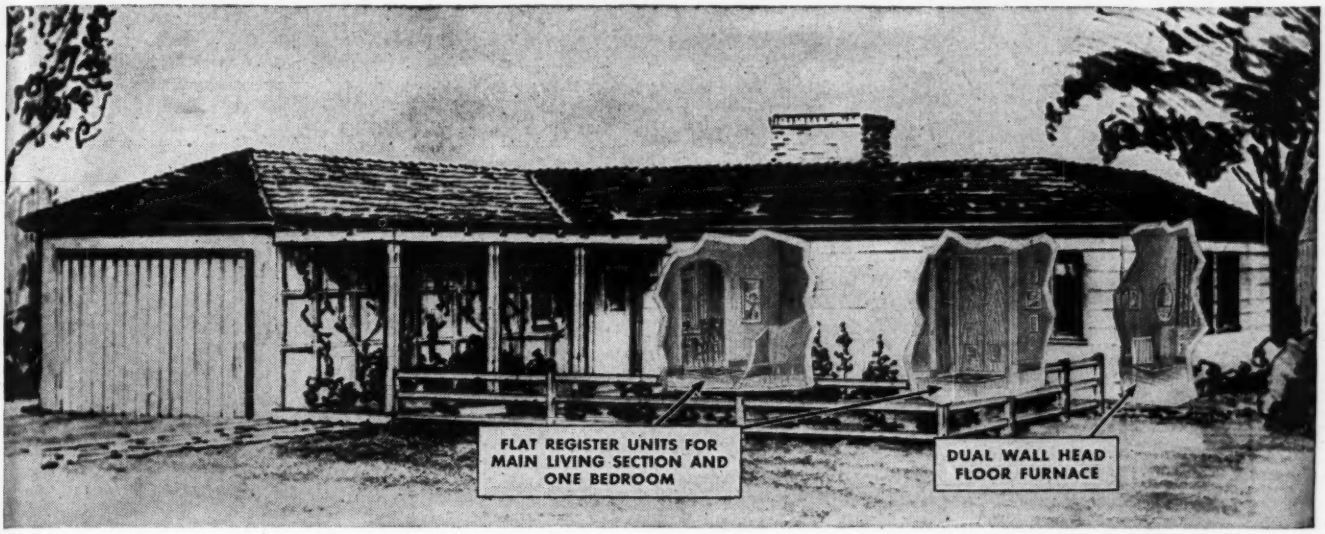
For Venting Gas-burning appliances



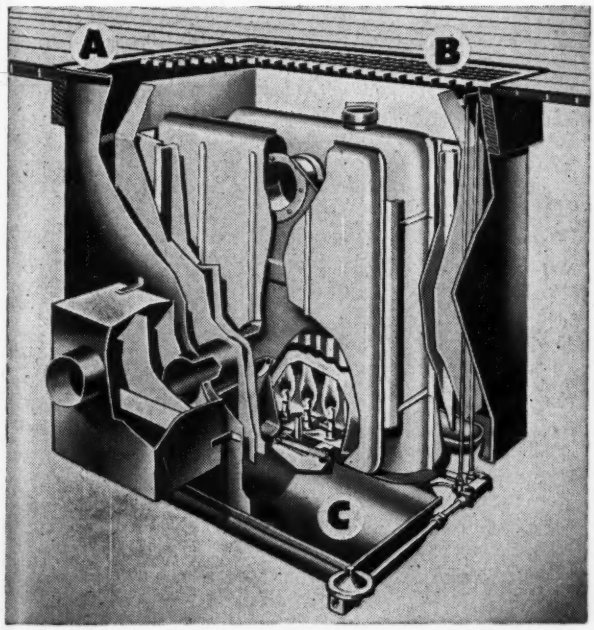
● Non-metallic Transite Flue Pipe not only is rustproof, it is light in weight . . . easy to install and support . . . can be cut to fit on the job. Neat and attractive in appearance, it needs no painting. 2" to 12" sizes; round and oval. Complete line of fittings and accessories.

For details, write for booklet TR-13A: Johns-Manville, 22 East 40th Street, New York 16, N. Y.

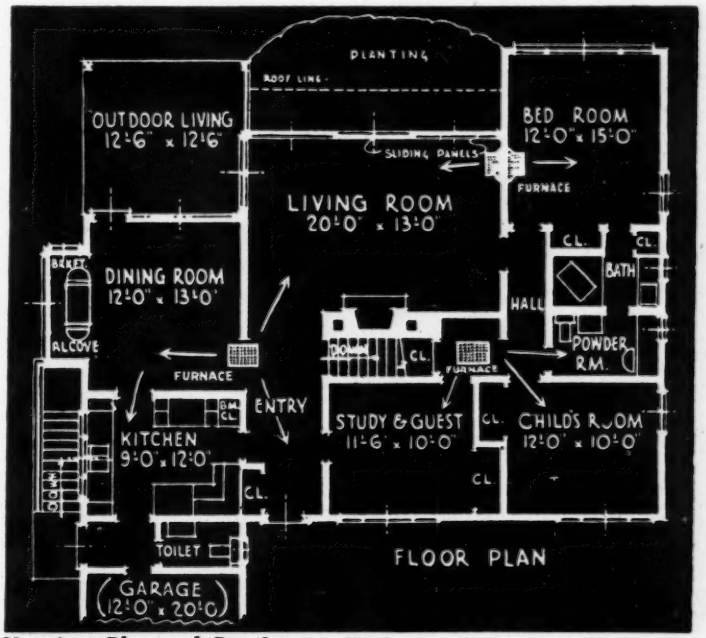
ADVANCED IDEA OPENS MORE POST-WAR HOMES TO GAS HEAT



By Multiple Unit Installations, the new Coleman Gas Floor Furnace system easily adapts itself to area heating of this post-war home. One or more floor furnaces may be used. Each unit is independently regulated by automatic controls. Low equipment cost, plus automatic ease and cleanliness, will win thousands to this idea of automatic gas heat post-war. No basement needed—furnaces are set in the floor itself. Here a 3-furnace installation is shown, adapted to the Nov. prize-winning "Miracle House" of Practical Builder Magazine. Architect, Edwin R. Bruno, Skokie, Ill.



Note In This Cutaway View three special features: (A) Large area of heating surface for fast warming of cold air from floor; (B) 80% open register for fast outflow of warm air; (C) streamlined bottom (patented Coleman feature) which speeds up warm air travel as much as 35%. This combination moves the heat; keeps warm air in circulation; insures "warm-floors" comfort.



Heating Planned By Areas. Each area is warmed by correct size Coleman Gas Floor Furnace. Independent operation, controls supply any degree of warmth desired in any one area: 80-degree heat in one area, 60-degree in another, with warm floors, top comfort, no waste of fuel. Write for catalog and information on Coleman Heating Equipment for post-war homes.—Coleman Lamp and Stove Company, Dept. G-538B, Wichita 1, Kansas.

THE "HOT" NAME IN HOME HEATING

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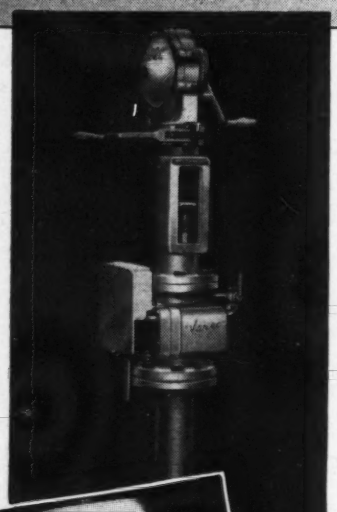
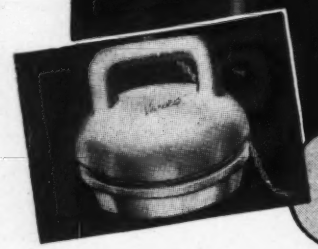
ACCURATE • GASTIGHT
"VAREC" approved HAND GAUGING and SAMPLING UNIT FOR PRESSURE STORAGE





"VAREC" approved Gastight Hand Gauging and Sampling Unit is used on all types of tanks for taking accurate gauges, temperatures, and spot or running samples without loss of tank pressure. Made of cast aluminum, semisteel or cast steel with bronze and Stainless Steel trim and tape, it is noncorrosive throughout. An adjustable quick release arm releases the neoprene-sealed coupling between the head and body. The sheave handle is equipped with a ratchet-stop held in place by a spring-loaded plunger. Thus, an automatic stop is provided at any desired level. In serving a group of tanks, blind heads with one or more portable heads, assure maximum performance with economy. The Sampling or Temperature Bomb is cadmium plated bronze and Stainless Steel trim. When sampling, a slight jerk on the tape opens or closes the valve. Thermometer is installed in mercury well.

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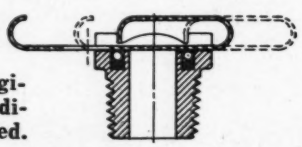

Whittaker

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CURRENT READING

Problems in Measurement of Wet Gas—T. C. Shaw. "Oil Weekly", Feb. 12, 1945, pp. 30-32, 36. There are a number of factors that have a pronounced effect on the problem of wet gas measurement, principally used in determining the coefficient to be used. Factors considered most important are: (1) Density of the fluid passing through the orifice; (2) Pulsating flow; (3) Deviation from true gas law; (4) Correct reading of the charts upon which the pressure and the differential are recorded. These factors are discussed.

Gas Repressuring Increases Glenn Pool, Oklahoma, Recovery—J. F. Sage. "Oil Weekly," Feb. 19, 1945, pp. 32, etc. This article is a review of the paper "Gas Repressuring at Glenn Pool," given by K. B. Barnes and J. F. Sage at the spring meeting of the Mid-Continent District API Division of Production at Tulsa May 20 and 21, 1943, and covers new developments in this pool from April, 1943, to December, 1944.

Condensates May Occupy Apparent Negative Volume in a Gas Reservoir—D. L. Katz and C. M. Sliepcevich. "Oil Weekly," Feb. 26, 1945, pp. 30, etc. Conditions cited showing that under unique conditions removal of condensate could cause dry gas to occupy a larger volume than wet gas occupied at the original pressure and temperature.

True Gas Conservation Means Ratable Taking—G. O. Ives. "Oil Weekly," Feb. 5, 1945, pp. 20, 23, 28. Cross-section of opinion shows that operators agree with broad principle but point to difficulties that may be expected in making practice uniform and mandatory. Quick solution of problem will be to advantage of all.

Pressure-Welded Pipe Line—E. Sterrett. "Welding Engineer," Feb., 1945, pp. 37-39. Designed primarily to weld railroad rails, the oxyacetylene pressure welding process has been extended successfully to the construction of natural-gas pipe lines of large diameter. This article gives details.

Dehydration of Supply Gas is Successful in Preventing Freeze-Ups of Pilot Regulators—L. S. Reid, "Petroleum Engineer," Jan. 1945, pp. 194, 197. Small dehydrator installations avoid loss of pressure and ultimate failure on downstream side of main regulator setting.

The Modern Gas Turbine, by R. T. Sawyer. Published 1945 by Prentice-Hall, Inc. This book contains up-to-date information on its uses as a supercharger and prime mover, including jet propulsion.

Mechanics of Producing Oil, Condensate, and Natural Gas—P. J. Jones. "Oil and Gas Journal," Feb. 10, 1945, pp. 99, etc., Part 15. Feb. 17, 1945, pp. 99, etc., Part 16. Feb. 24, 1945, pp. 140, etc., Part 17.

R. I. 3783—U. S. Bureau of Mines, Air and Gas Injection in the Oil Fields of Illinois, by C. M. Keithly and T. Jennings.

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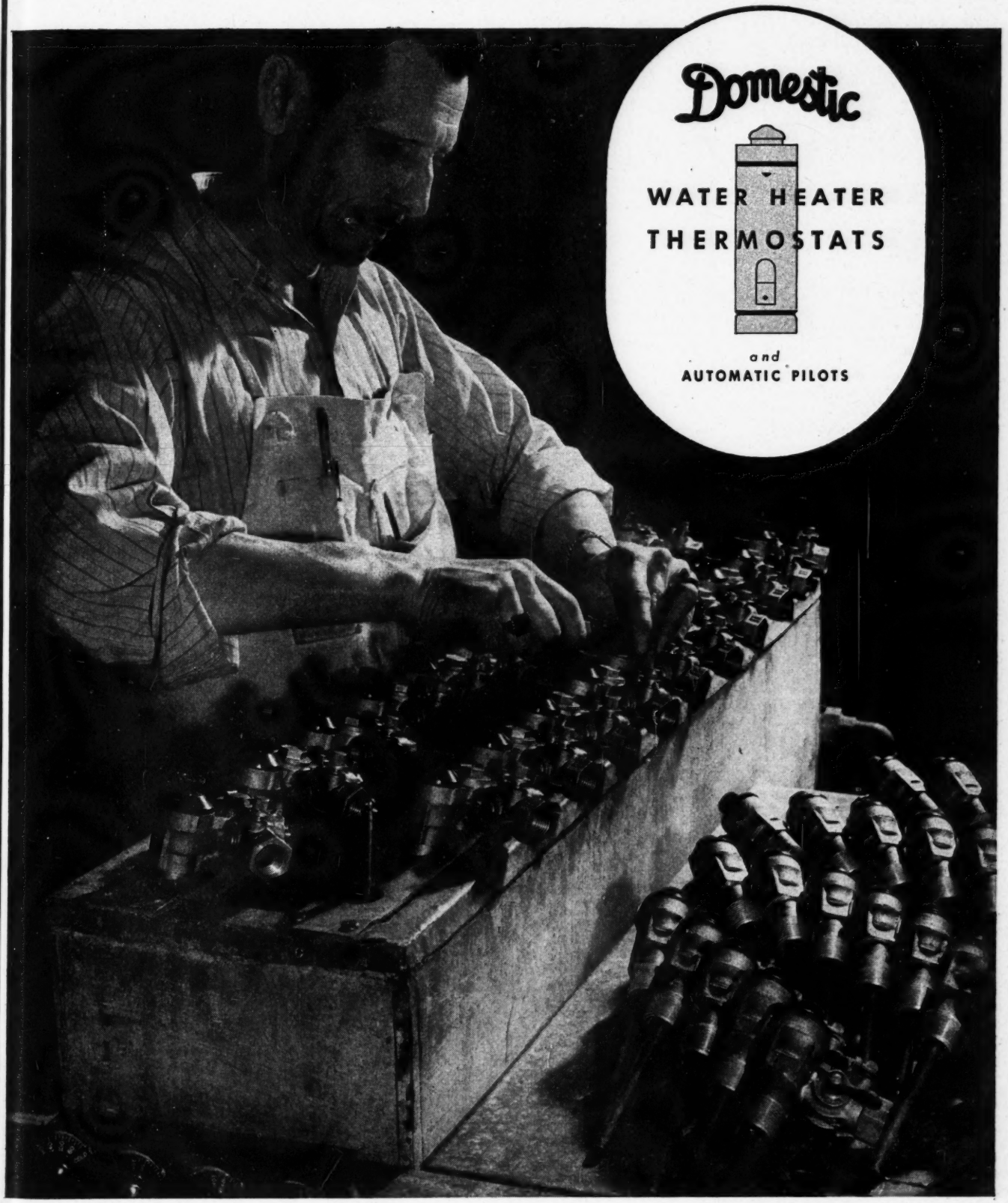
Each Domestic built thermostatic control is carefully inspected as it goes along the assembly line. Each is calibrated through the "hot water" test to make doubly sure of its dependability.

This constant checking, plus dependable material and patented features, is the reason owners of Domestic controlled water heaters are sure of water as hot as they want it when they want it.



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Pittsburgh Utilities Establish Low Accident Record

W. H. Adams, safety director of the Pittsburgh group of public utility companies within the Columbia Gas & Electric Corp. (Manufacturers Light & Heat Co., the Natural Gas Co. of West Virginia, the Cumberland & Allegheny Gas Co. and the Gettysburg Gas Corp.) recently announced that 450 trucks and automobiles operated by these companies travelled 5,354,621 miles during 1944 and were involved in only 45 accidents. Adams said that this was the lowest accident record in nearly 20 years within the group.

Under Adams' direction, group safety meetings of supervisors and employees are conducted frequently throughout Pennsylvania, West Virginia, Ohio and Maryland. Frank discussions are held pertaining to driving hazards and corrective measures which might be taken to eliminate or reduce the possibility of accidents.

Southern California Utility Publishes Dealer Paper

In the interests of its gas appliance dealers, the Southern California Gas Co., Los Angeles this month began publication of a bi-monthly, four-page paper, "Dealer News," to keep dealers posted on the now rapidly changing merchandising trends.

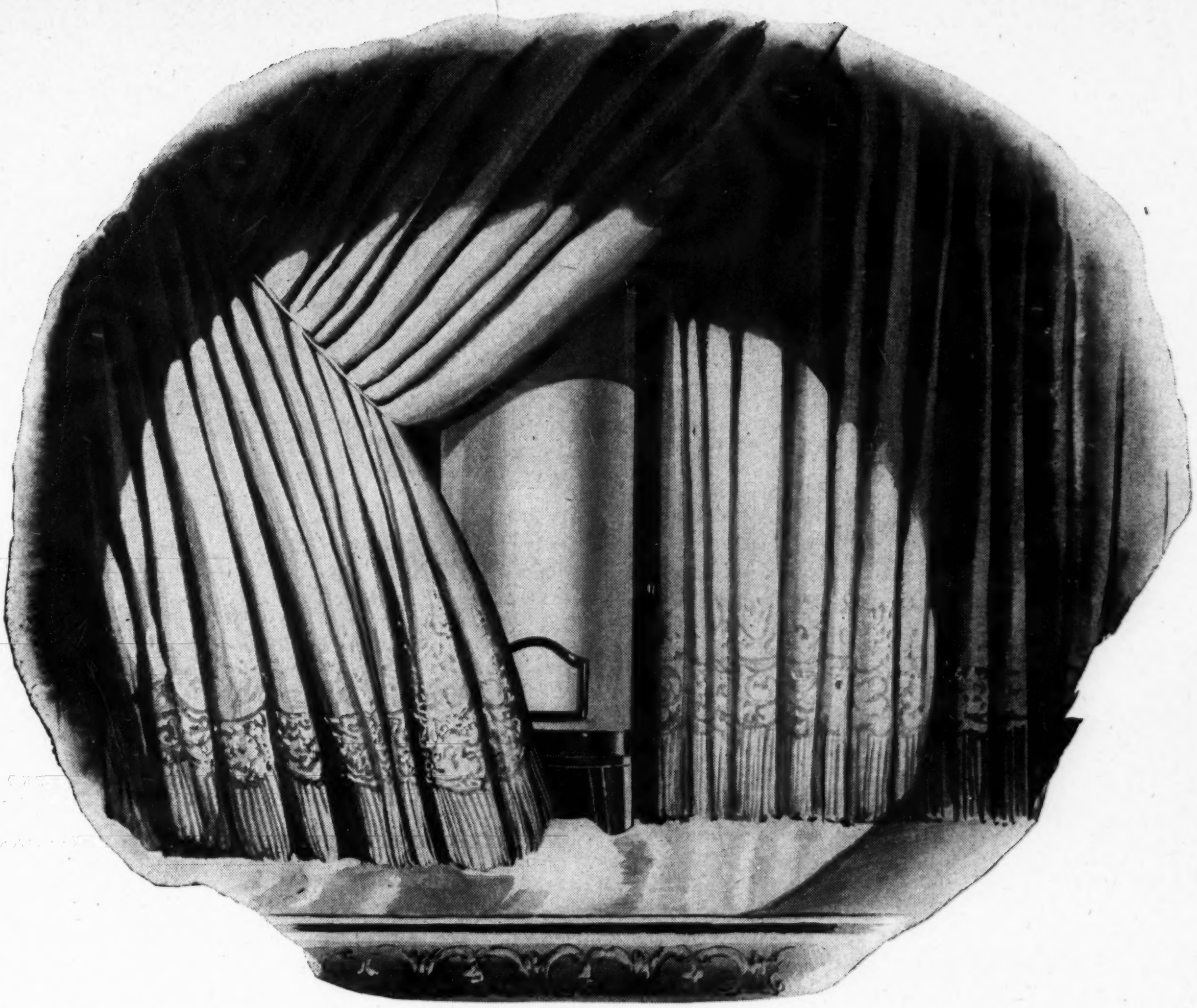
"Dealer News" features a column, "Ed Kern Says," by J. E. Kern, general supervisor, appliance and dealer sales. The book is edited by Bob Crosby. Included in the contents will be news about new gas appliances, new angles on merchandising, a resume of happenings of associations, as well as important announcements concerning sales programs, postwar plans, surveys, and policies for the years ahead.

Texas Gas Waste Studied By Conservation Committee

A study of possible gas wastage in the 10 or 12 largest fields of Texas will be undertaken by the engineering committee of the industry's conservation committee, it was decided at a recent meeting with the Railroad Commission. The engineer report will be given in a month or so, at which time the industry advisory committee, of which James Nash of Austin, Texas, is chairman, will meet. The two groups were set up following a natural gas conference called in March by the commission. Immediate objectives are a study of physical waste of gas by flaring, popping and venting and recommendation to prevent waste.

API Appoints Special Pipeline Committee

The appointment of a Special Pipe Line Study Committee of the American Petroleum Institute was announced recently by William R. Boyd, Jr., president. Boyd states that the committee will engage in a factual study and analysis of pipeline transportation problems, reporting the results and recommendations to the Executive Committee of the Institute. Available reports on pipeline transportation issued by such agencies as the Interstate Commerce Commission and the Association of American Railroads will be assembled and studied, Boyd said.



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Everdur combines the corrosion resistance of copper with the tensile strength of mild steel. Its workability and ready weldability mean swifter and more economical production for the manufacturer and an all-around better product at moderate cost for the homeowner. 4480

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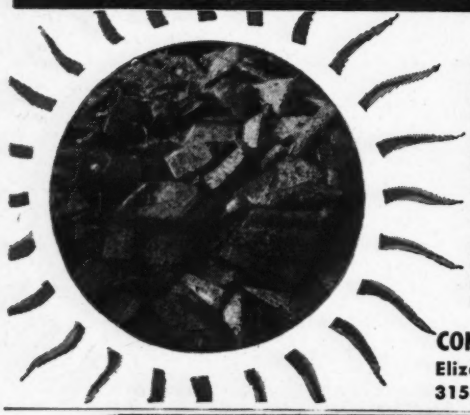

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Pacific Coast Gas Sales Break Record for 1944

A recent news letter of the Pacific Coast Gas Association reveals that all records were again broken by the gas industry on the Pacific Coast in 1944. Customers in California reached a total of 2,098,219, a gain of 2.8% over 1943. Total gas sales of 338 million Mcf and gross revenues of $121 million were 12% and 13.3% over 1943 respectively.

The sale of gas appliances on the Pacific Coast was greater in 1944 than in 1943. Gas range sales were increased some 30% from the 1943 low, water heater sales up 45%, and heating furnaces and stoves up more than 100%, due to the necessities of the greater population and liberalization of manufacturing controls during the summer. The number of appliances sold, however, was far below those sold in a normal prewar year and the unfilled demand at the close of 1944 was greater than at the beginning.

American Stove Organizes New Sales Research Dept.

The American Stove Co., Cleveland, announces the recent organization, by Stanley E. Little, vice president in charge of sales, of a market and sales research department, representing the company's latest step in its program of preparation for the postwar period. The new department is under the management of Marc W. Pender, who has been with the company since 1929. Since the war, Pender has been in Washington, D. C., where he handled the company's relations with the services and government agencies in connection with their production of war materiel. Until a greater volume of gas ranges can be produced, Pender will continue to make his headquarters in Washington and coordinate the affairs of the new market and sales research department from there.

Kansas Utility Sold

The Goodland Independent Gas Co., Goodland, Kans., has been purchased by L. L. Laughlin, of Alma, Neb., from W. A. Rezeau. A few months ago, before the transaction was consumated, Laughlin reported that he had arranged for a pipeline to connect with the Northern Natural Gas Co. line running north from the Hugoton field into Nebraska to bring natural gas to Goodland as soon as WPB would grant permission to use the pipe. Until that time he will continue to furnish butane gas through the present facilities.

Laughlin has been in the gas business since graduating from Texas A. & M. in 1927, at which time he joined the Kansas Power & Light Co., with headquarters in Manhattan, as division manager. In 1936 he installed the system at Alma, Nebr.

Gas Engineer Wanted

A well established consulting organization in New York has opening for Gas Engineer qualified to undertake economic studies, planning and design of manufactured gas plants and systems. Applicants please submit experience record, education, age and salary required. Write GAS, Box 650, 1709 W. 8th St., Los Angeles 14, California.